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Thyratrons Used to Maintain Proper Tension in Wire Reeling

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IMPORTANT factors governing copper wire drawing speeds are proper lubrication of the wire, dies suitable to the work to be performed, and machines which can be operated with safety when equipped with a highly sensitive take-up mechanism to maintain a constant tension on the outgoing wire as the spool is filled with wire. The problem of reeling up this wire presents itself as follows:

After wire has been drawn and comes off the last block, at substantially constant linear speed, it is necessary to reel it up. The finished wire leaves the last block at some constant linear speed, which, for copper wire, may be of the order of 2000 or 3000 ft. a minute, or about 30 miles an hour. As the reel builds up from empty to full, the motor driving the reel must slow down proportionately as the reel diameter increases.

Reeling at constant linear speed requires a very sensitive take-up device to adjust the speed of the reeling motor. But in reality the adjustment of speed is secondary, and a consequence of the necessity of holding constant tension on the wire as it is reeled up.

The sensitiveness required of such a reel motor control can be appreciated by considering the requirements to be met when drawing No. 42 B&S copper wire at a speed of, say, 2000 ft. a minute. The breaking strength of wire of that diameter is in the neighborhood of 170 grams (6 oz.) and the pull required to draw No. 41 wire through a No. 42 die is about 87 grams (3 oz.) Thus a control system to reel up such fine copper wire must hold tension on the outgoing wire to within very narrow limits, to prevent breaking.

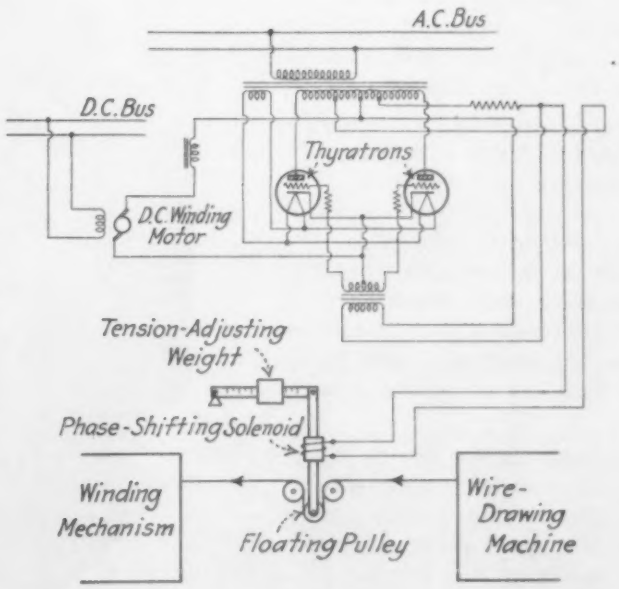

FIG. 1. A change in the tension of the wire allows the balanced solenoid to rise or fall and this in turn energizes the Thyratron and in that way the speed of the driving electric motor is controlled.

Let us examine the various alternatives in the general consideration of such a control. Suppose that on the wire being reeled it is desired to hold a constant tension of, say, 2.5 lb. at a delivery speed of 1500 ft. a minute. The horsepower required to drive the reel, less friction, will obviously be:

$$HP. = \frac{2.5 \times 1500}{33{,}000} = 0.1135$$

That is, we have a force of 2.5 lb. traveling at a speed of 1500 ft. a minute, which means a constant horsepower requirement. Any losses in the gears between driving motor and reel

ONE of the newer methods of control of manufacturing operations is by means of the thyratron—a newly developed electric tube. It has been applied to control motor speeds in high-speed reeling of wire that is ordinarily regarded as fragile. The adjustment and control appear to be exceptionally delicate, and indeed they have to be in some instances, because of the narrow margin within which the work may be performed. The article contains suggestions of a widening use of this new form of electric cell.

must be added, to get the actual output required from the motor.

If the motor driving the reel is operating from a constant-potential, direct-current bus, such as the 230-volt shop circuit, then a control system which holds constant current input, and consequently constant kilowatt or horsepower input, by weakening or strengthening the field of the motor, can easily be designed to adjust the speed of the reel automatically, thus holding the desired tension. This neglects the rather important item of friction in the reel drive.

Such a control scheme is largely used on cold strip mills, where as much as 50 to 100 hp. is required to hold the constant tension. The control used in such a case consists essentially of a current regulator in the armature circuit of the motor, which holds constant current input, and consequently constant power input, since the voltage is constant.

The difficulty with a scheme which tends to hold constant kilowatt or horsepower input to a motor for reeling up wire, such as very fine copper wire, is that the output of the motor does not all go into the reel. A considerable portion of it may go into gear and real friction. Thus, in the example where it is desired to hold 2.5 lb. tension, there might very well be friction amounting to 1 or 2 lb. If the 0.1135-hp. input is held constant, most of it will go into friction, with a consequent loss of tension held on the wire.

Even if an allowance is made in the setting of the input regulator for this friction load, it can exactly compensate for the frictional load at only one particular motor speed. If the speed decreases as much as 2 to 1 as the reel builds up, the frictional load in horsepower decreases with the speed, since the friction torque remains about constant. If an allowance is made in the load regulator setting with the reel empty, the tension actually held on the wire will increase as the diameter of the spool increases, since the motor slows down and less and less horsepower input goes into friction.

For these reasons, where the friction load on the reel motor is likely to be large compared with the tension to be held, a load regulator actuated by the input to the motor is likely to be unsatisfactory.

A system frequently used to control the speed of the reel is to loop the wire under a movable pulley held down by an adjustable spring. If the tension on the loop of wire around the pulley increases beyond the spring setting, a clutch between reel and driving motor is made to slip and relieve the increase in tension. This system does not depend on the input to the motor, but tension is determined entirely by the spring setting of the idler pulley.

Another system for reeling wire under constant tension without the use of load regulators or clutches has proved very successful in operation. The method of operating the reel drive involves the use of the floating roll, whose position in space determines whether or not the motor will speed up or slow down. This general method of operation may be understood from reference to Fig. 1.

As the wire leaves the last block of the wire-drawing machine proper, it passes under the movable or floating pulley before going to the reel. The tension to be held on the wire is determined by the weight of the floating roll and the position of the weight on the tension-adjusting lever. Thus, as long

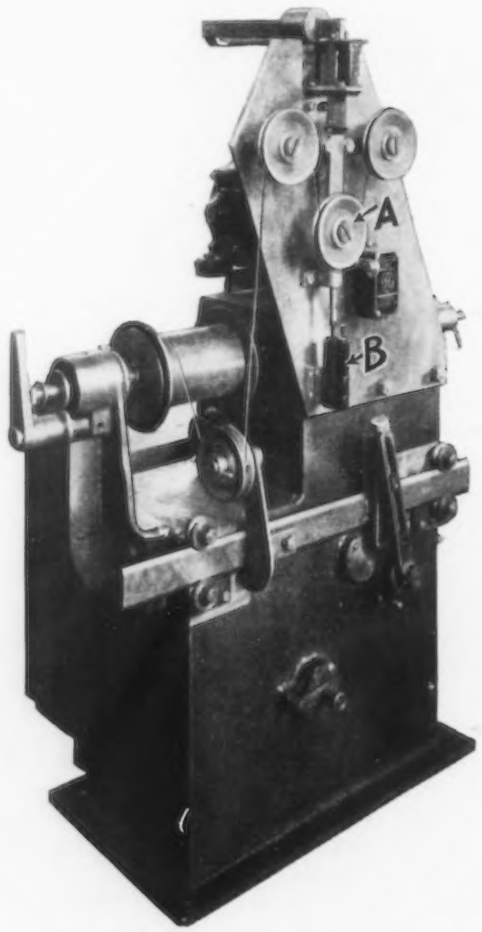

FIG. 2. Mounted alongside the spool on which the wire is being reeled is the floating pulley (A) of the Thyratron control. The oil dash-pot is at B.

as the floating roll is not up against the stop, constant tension is assured on the wire.

Any movement of the floating pulley moves the armature of a small solenoid up or down. The movement of the armature in this solenoid changes the inductance of the grid circuit of a Thyratron control unit. The Thyratron control unit consists principally of two electron tubes very similar in operation to mercury-arc rectifiers. They are so arranged that a change of inductance in the grid circuit enables them to raise or lower the voltage of their output. There are absolutely no contacts in the system.

This Thyratron control unit raises or lowers the voltage on the armature of the reel-driving motor, in accordance with the change of inductance of the small solenoid. As the voltage is raised or lowered across the direct current reel motor, it speeds up or slows down. A movement of 2 in. on the solenoid plunger will control the speed of the reel motor from standstill to full speed. When the floating pulley is down, the motor speeds up; when the floating pulley is raised, the motor slows down.

Let us follow through a complete duty cycle of such a system of control.

Suppose that it is desired to hold 2.5 lb. tension on the wire, with a delivery speed of 1500 ft. a minute.

Method of Operation

The operator adjusts the weight of the floating pulley to 2.5 lb. Enough wire is pulled out to thread around the pulley and attach to the winding reel. The reel is running at full speed, however, because the floating pulley is at the bottom position, against the stop. To stop the reel motor, for attaching the wire, the operator simply raises the pulley with his hand. This stops the reel. After attaching the wire to the reel, the pulley is let down, which speeds up the reel motor, until all slack is taken up. Thereafter the control is in complete charge and holds the pulley in nearly a fixed position. Such a system will maintain constant tension even at standstill.

If, for some reason or other, the delivery speed of the wire-drawing machine is suddenly decreased, the winding reel will be traveling slightly too fast and will attempt to raise the pulley. When this happens, it immediately causes a decrease in voltage across the reel motor armature, because the voltage is lowered corresponding to the movement of the pulley.

In this manner the speed of the winding reel is adjusted to the new delivery speed of the wire-drawing machine, without attention on the part of the operator.

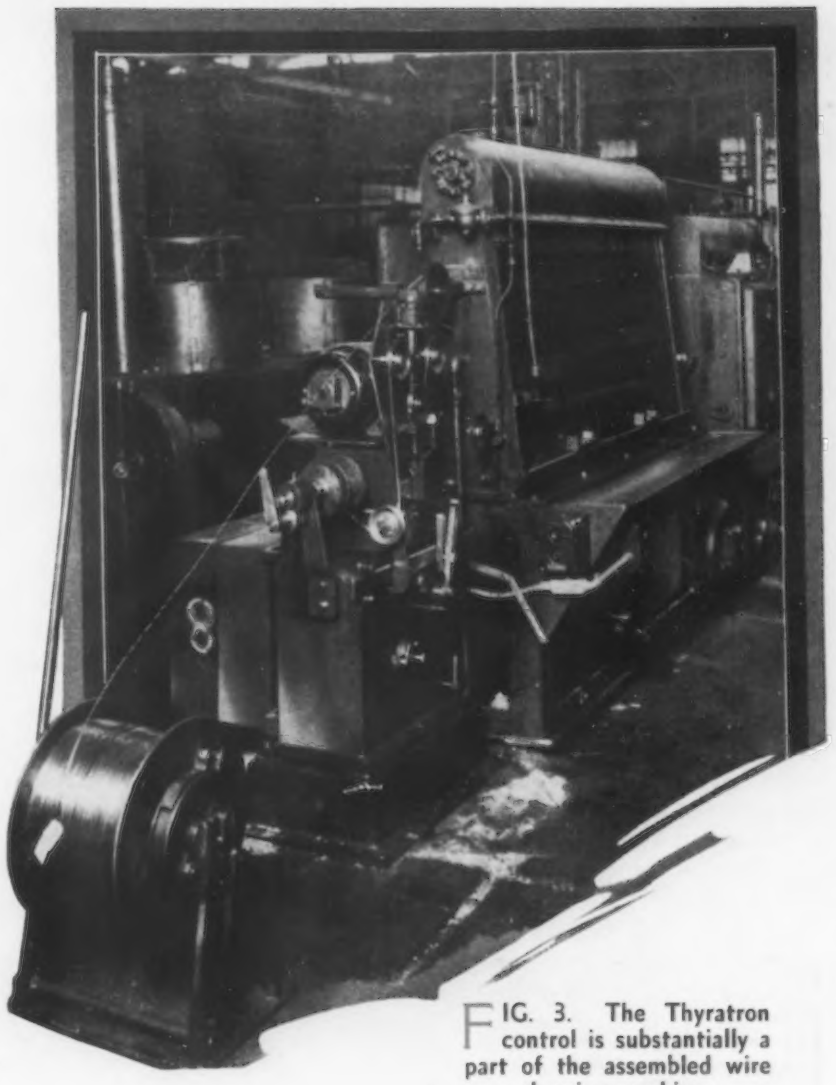

FIG. 3. The Thyratron control is substantially a part of the assembled wire drawing machine.

If it is desired to shut down the wire-drawing machine and still maintain constant tension on the outgoing wire, to prevent unwinding of the reel, it is only necessary for the operator to press the "stop" button of the main wire-drawing motor. The pulley will tend to rise slightly during the slowing down period, which will cause the reel motor to slow down and ultimately come to a stop, with the pulley only slightly raised to a new position. If it is then desired to start up the main wire-drawing motor, it is only necessary to press the "start" button on that machine and the reverse process on the control of the reel motor will hold constant tension as the linear speed of the outgoing wire increases.

As the diameter of the reel builds up, it will tend to raise the floating roll slightly; but, since this tends to slow down the reel motor, the speed is adjusted to compensate for the new diameter. If, for any reason, the mill operator speeds up the wire-drawing machine, the pulley tends to drop slightly, which speeds up the reel.

Thus it is seen that this control is in reality a "constant position" control for the floating pulley, while the tension to be held on the outgoing wire is a function only of the weight of the pulley and its component parts. A small oil dash-pot is at-

tached to the floating roll to prevent any tendency to hunt.

The control as shown in Fig. 1 holds constant tension by adjusting the voltage across the motor armature, with constant field strength. For larger motors the Thyratrons may be made to control the motor field, while the armature operates at constant voltage.

Fig. 2 shows the arrangement of the floating pulley (A), the oil dash-pot below it and the method of adjusting the amount of tension to be held on the outgoing wire. The motor for driving the spool is directly behind the equipment.

A completely assembled wire-drawing machine appears in Figs. 3 and 4. The latter shows the entire machine, and also shows the Thyratron control unit with the cover removed.

Other Possible Uses

For installation of such a control, it is only necessary to have a source of alternating current which is controlled and rectified by the two Thyratrons, and supplied to the reel motor armature as direct current. It is desirable to have a source of direct current to supply the real motor field. If no direct current is available, it is possible to use another small Thyratron panel, somewhat differently arranged, which would supply both field and armature voltage directly from the alternating current line.

While this system has been discussed for copper wire reeling, it is, of course, applicable to any kind of reeling. It is applicable, for example, to the reeling of aluminum foil as it comes from the rolling mill. The tension in such an application must be held within very narrow limits, to prevent tearing the foil. This type of control is admirably suited to such an application.

It has been proposed, though not actually used as yet, for reeling iron and steel wire, as it comes from the continuous machines, or where it is necessary to reel it after it comes from a continuous annealing process.

Roll Diameters in Rolling Steel

Small roll diameters in rolling steel increase the demands on the roll material, owing to the deep grooves, the large lateral forces on the collars, and the unequal cooling rates. Therefore, says Dr. Johann Puppe, rolls with deep passes are generally made of steel of 85,000 to 110,000 lb. per sq. in. strength, or for small sections steel rings are shrunk on the roll. More accurate accounting of rolling costs, he says, has resulted in the use of better materials in rolls. As plain carbon steels can not meet the requirements, alloy steels are finding increasing use. Long experience has convinced him that the greater utility of alloy steel rolls lowers the net rolling costs in spite of their higher first cost.

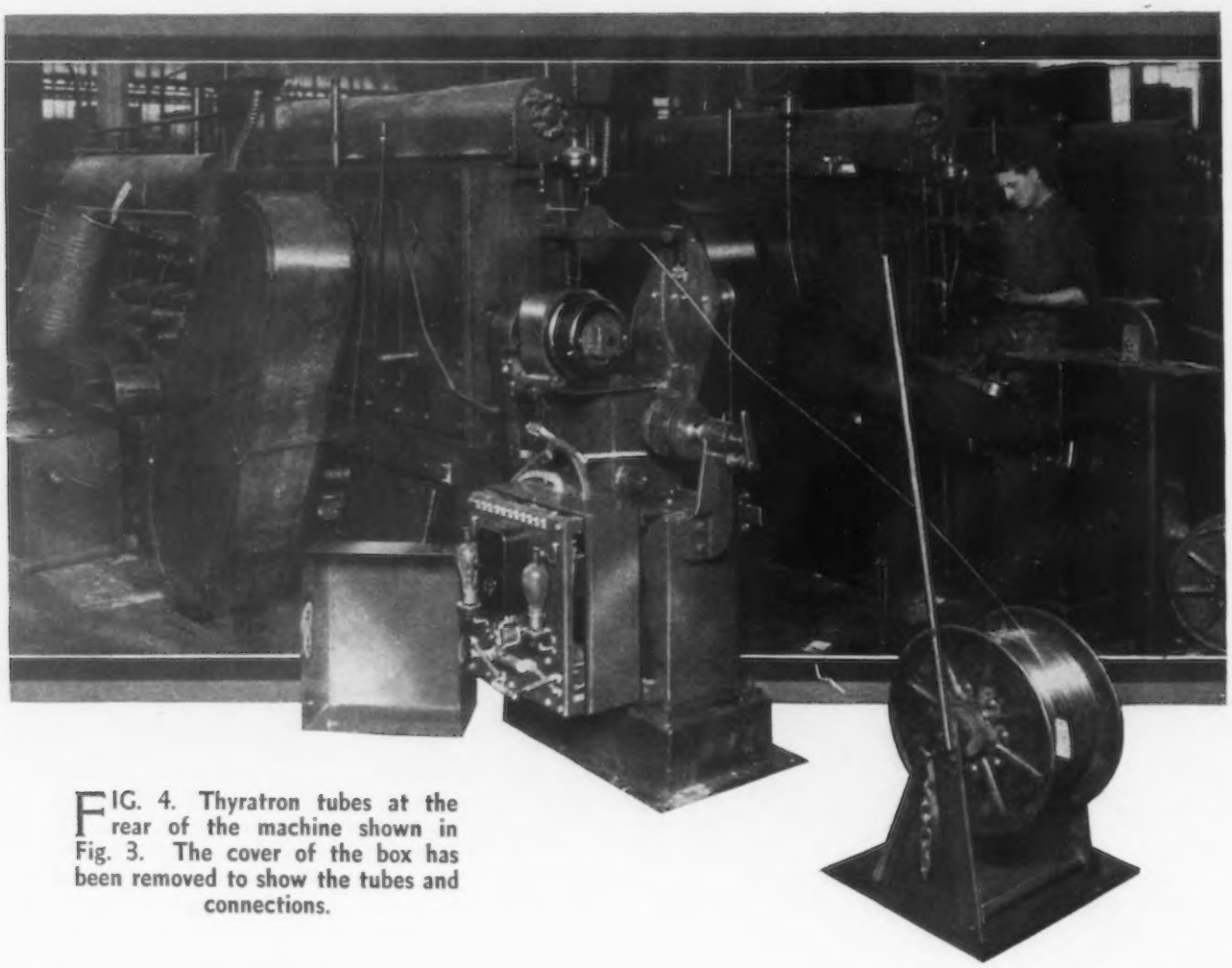

FIG. 4. Thyratron tubes at the rear of the machine shown in Fig. 3. The cover of the box has been removed to show the tubes and connections.

POURING 90 TONS OF IRON

POURING a casting in the iron foundry of the General Electric Co. at Schenectady. It is to be part of a 75-ton exhaust hood for a 165,000-kw. turbine for the Brooklyn Edison Co. A total of 90 tons of metal was poured to make the 75-ton casting

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Tool Steel Progress in the Twentieth Century

By DR. JOHN A. MATHEWS
Vice-President,
Crucible Steel Co. of America

THE year 1900 may well be accepted as a milepost in the evolution of metallurgy. We may call the period since then the "Alloy Steel Age," or possibly we should not be so exclusive but merely designate it as the "Alloy Age," for the progress in ferrous and nonferrous alloys has probably been equally marked during the last 30 years.

In designating the 20th century as the Alloy Age, we must not think that no alloy steels were produced prior to the present century. Michael Faraday, who was a pioneer in a great many things, was also a pioneer in making alloy steels; in fact, he covered a rather wide range of elements, even including metals which we would not consider adding to iron today, such as silver, gold, platinum and palladium.

Year 1900 a Dividing Point

YOU may wonder why the year 1900 is selected as marking a dividing point in steel metallurgy. In my opinion the introduction of high-speed steel in that year and the results attained by this epoch-making event are sufficient ground. But, along with this, I might also include the commercial introduction of electric furnace steel making, which has exercised a profound influence in the manufacture of the finer grades of steel, especially the alloy steels.

At the beginning of this century, high-speed steel as we know it, did not exist. There were no electric furnaces in this country for the production of steel. Vanadium was a chemical curiosity and the microscope as an aid in research was but little used and the information obtained with it was not highly regarded in plants. Pyrometers were scarcely used at all in industry and were not too common in laboratories. In fact, the laboratory work in those days consisted of routine chemical analysis and I might almost say that metallurgists, as we know them today, did not exist. Those with metallurgical knowledge, for the most part, had acquired it by practical experience in the mills themselves, sometimes based upon a prior knowledge of chemistry. Scientific methods were not in high favor with the empirical steel worker.

Nevertheless, I do not want you to think that good tool steel and good tools were not made at that time. Such was not the case. These men produced real results and had trained their powers of observation to a very unusual extent. They knew steel. Too many of us only know something about steel. If we want to distinguish the period prior to 1900 from the period since, we might say that the former was an era of process development and the latter an era of products development.

High-Speed Steel and Electric Furnace

We have referred to the introduction of high-speed steel and of the electric furnace as the outstanding events responsible for the progress of the last 30 years. First, as regards high-speed steel, it should be understood that what was really developed in the first instance was a high temperature heat treatment rather than a composition of steel. This fact is frequently overlooked. The steel largely employed by Taylor and White in their earlier experiments was the old fashioned, air hardening steel, subjected to an austenitizing treatment. Most of the steel employed by them was the Midvale air-hardening steel and the Sanderson self-hardening steel.

After the high heat treatment was discovered, there appeared on the horizon, in every steel-making country, a great variety of new steels more nearly approaching present day high-speed steel analyses. I have spent a great deal of time trying to locate the actual source of present day high-speed steel analyses. It differs from the air-hardening steel in containing about one-third as much carbon and twice as much tungsten. As early as 1901 we obtained samples of steel, in which this sudden change had taken place, from English, German, French and American sources. I have never been able to learn the source of the first steel actually made of the new type. The introduction of high-speed steel was so momentous and far-reaching in its consequences that the first thing that was necessary was to redesign all kinds of machine tools, giving them sufficient power and stability to secure from the high-speed tools maximum output and efficiency. The steel brought about a revolution in the machine tool trade.

Within a very few years, steel from 12 to 18 per

cent tungsten appeared, with chromium from 3 to 4 per cent and with a somewhat wild variation of carbon content. This might be accounted for by the difficulties experienced in attaining a uniform analysis with the kind of raw materials available, when melting in crucibles, and also by lack of knowledge at that time as to just what constituted the best carbon range for the different purposes for which high-speed steel was used. These earlier types of high-speed steel were looked upon as marvels of cutting efficiency and they had a great deal to do with ushering in the modern era of high-speed automatic tool production. Their economic importance can scarcely be estimated.

Vanadium in Alloy Steels

About 1903 the writer began experimenting with vanadium and produced carbon-vanadium tool steels, chromium-vanadium, nickel-vanadium and nickel-chromium-vanadium structural alloys and vanadium high-speed steel. This, bear in mind, was before the days of the American Vanadium Co., now known as the Vanadium Corporation of America. The first vanadium I used cost $12.50 a lb. These experiments resulted in the development of our Rex AA steel, which was put on the market just 25 years ago. This steel was from two to three times as efficient as any of the earlier high-speed steels without vanadium. It was, in fact, the 18-4-1 type of steel which is now generally regarded as the standard of all-around efficiency and it has been imitated by practically every maker of high-speed steel for upward of 25 years. No higher compliment can be paid to a product and the fact that it has maintained this leading position for one-quarter of a century, and that no radically new type has ever been developed to supplant it, is of more than passing interest in this day when frequent changes are the order of the day.

Electric Furnace in Steel Making

THE electric furnace for steel manufacture was probably the outcome of the still earlier use of electric furnaces in the manufacture of calcium carbide. The material had been produced in a great many places in Europe and America and along with the carborundum production in this country, introduced by Dr. E. G. Acheson, constitutes an early development of commercial electric furnace work. Sir William Siemens, a great many years earlier, had done some experimental work in arc melting.

It Has Functioned in Two Ways

The electric metallurgical furnace has functioned in two ways to account for recent progress in tool steel—first, in the direct melting process for the steel itself, and the reasons for its success are principally due to its ability to both dephosphorize and desulphurize. The reducing action of electric furnace slag tends to reduce the loss of alloying materials of easily oxidizable metals, such as chromium, vanadium and manganese and to recover these metals when present in the form of scrap. This process is also cheaper than the old crucible melting method; in fact, approaches the open-hearth in that regard more nearly than it does the crucible process.

The second method in which the electric furnace has been used is the smelting process as distinguished from the melting process. The smelting process is responsible for the production of very high quality ferroalloys with which the industry is now provided. It was mentioned earlier that in 1900 there was no low-carbon ferrochromium, ferrosilicon or ferromanganese available, and, consequently, one could not produce alloy steels containing high amounts of these elements without having the carbon go up pro rata with the added alloy. While this is not so serious in connection with the manufacture of tool steels, which are usually fairly high in carbon, it would make impossible the manufacture of the low-carbon structural alloys that we have today.

I might also mention that, about the same time as the introduction of the electric smelting furnace, the Goldschmidt thermit process appeared, by means of which carbonless alloys were made available, aluminum being used as the reducing agent for the removal of oxygen from the ores. I think I witnessed the first demonstration of this process in England at the Royal Institution in 1901.

First Electric Furnace in 1905

The first electric steel making furnace was installed at the newly built Halcomb Steel Co. in Syracuse in 1905 and actually began operations on

Dr. J. A. Mathews

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DR. MATHEWS is recognized as a leading authority on tool and special alloy steels and his review of the progress in the last 30 years is, therefore, of special interest. It was delivered as a lecture at the first meeting of the 1930-1931 season of the New York chapter of the American Society for Steel Treating, held Oct. 13, and was also presented before the Syracuse chapter on Dec. 3. An abstract is here published.

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April 5, 1906. This was a 4-ton single-phase electric furnace. It was built to operate as a refining process, the preliminary melting being done in a tilting open-hearth furnace. At that time it was not thought possible that electricity would ever be used for doing the original melting. For some time the Halcomb furnace was the only one in this country, but now there are several hundreds of them with capacities from 1/2 ton up to 100 tons.

You will have noticed by this time the writer's conviction that the best way to appreciate the present and to prepare for the future is by a study of the past for "'Tis thus that men may rise on stepping stones of their dead selves to higher things," as some philosopher has so well stated. You will also have noted that this paper is largely of a reminiscent character, based upon the writer's association with metallurgy for 30 years and with his present company for 28 years.

It has been shown that early in the period under discussion the electric furnace was introduced for the production of higher grade ferroalloys and higher grade steels and that high-speed steels had been introduced for the fabrication of all kinds of metals and that, in its most widely used form, it has been available since 1905. Of course, there are many modifications of the 18-4-1 type of high-speed steel as represented by Rex AA, but these, in general, we may consider "special purpose" high-speed steels, while the standard type has the widest applicability and is the simplest to handle in heat treating. Various additions to the standard analysis have been exploited from time to time but the only one of these which has demonstrated its usefulness is the addition of cobalt, and steels with a substantial cobalt addition have been available for a great many years, but we also include these among the "special purpose" high-speed types.

So-Called Semi-High-Speed Steels

Early in the century the development of hot-forming methods, other than hammering and rolling, came into prominence, particularly including the upsetting machines in which metal was formed in dies in very intricate shapes and, of course, the hot forming of bolts and nuts is an old practice. The demand for superior steels for the dies and tools used in these processes resulted in the development of a type of tungsten hot die steel which was represented at that time by our Peerless "A."

At one time the name "semi-high-speed" was applied to such steels, but the use of this term has almost disappeared because it was so loosely used in connection with almost any steel which contained any tungsten. Peerless "A" steel, as a matter of fact, contains just about one-half the tungsten and one-half the carbon of high-speed steel, and might with some reason, therefore, be referred to as semi-high-speed, although it is never used as a high-speed cutting tool. The introduction of this material about 20 years ago met a very important need of industry and it was used very extensively, not only in this country, but was exported quite largely to England and France.

Oil-Hardening and Other Die Steels

It may be a surprise to you to know that prior to 1905 there was no oil-hardening die steel. Some tool steel, particularly very light gages, and edged tools, were from time to time hardened in oil, but the introduction of Ketos steel at the beginning of Halcomb's activities was the first time that any steel had been available which would harden sufficiently for dies when quenched in oil in fairly large masses.

This not only was of great advantage from the standpoint of safety in hardening of intricate tools but a secondary advantage arose from the minimum of distortion or change in shape which was characteristic of their oil-hardening Ketos steel. While this product was not of as great primary interest to tool steel users as high-speed steel, yet it was enthusiastically received and filled a real need in tool and die shops.

Of more recent date is the high-carbon, high-chromium type of die steel, which in some of its modifications is air-hardening as well as oil-hardening. To the best of my knowledge the earliest type of this material used in this country was furnished by the Midvale Steel Co., at least 15 years ago.

It is scarcely accurate to describe all of these materials as "non-deforming" for the simple reason that one cannot change pearlite into martensite without volume changes occurring. What actually happens is that some volume change takes place on quenching but the material returns very closely to its original volume on tempering. The exact degree to which it will return is influenced, first, by the quenching temperature and, second, by the degree of tempering.

It is obvious that with a score or more of relatively low-priced metallic elements available, there is an infinite variety of combinations possible and some of you may feel that the number of alloy steels available approaches infinity. This, I fear, was the inevitable result of experimentation made possible by the introduction of the electric furnace and the availability of a very wide range of high-quality ferroalloys.

Many of the alloys produced during the past few years are already obsolete and others will become obsolete as soon as sufficient experience is accumulated to determine which are really worthy of adoption as standard types.

Value of Metallurgical Control

My experience with the use of alloy tool steels has been that they are capable of giving either extremely good or extremely bad results and that, in general, results with most alloy tool steels have not proved as consistently uniform as we might expect them to be.

Results are likely to be better when the products

are used under perfectly controlled metallurgical direction, as for example, in tool-making plants or the plants of large companies where metallurgical skill is always available. The same steels put out into the hands of small users are apt to prove erratic simply because no metallurgical control exists, their nature is not understood, and heat-treating instructions furnished by the makers are apt to be mislaid or overlooked.

We cannot begin to enumerate all the types of alloy steels which have appeared but we have pointed out the outstanding developments and would now like to consider the question of progress in the industry from another point of view.

Some of the metallurgical conditions that existed about the year 1900 were pointed out. I might have added that at that time the tool steel manufacturer was the accepted authority in regard to his products and his recommendations were relied upon exclusively by the users. The user, in only very rare instances, employed chemists or metallurgists, and the tool steel maker considered the problems of industry and made his recommendations. Chemical analysis of the grade submitted was never discussed. Owing to the rapid growth of the manufacturing industry and the formation of very large companies, there has come about the employment of metallurgists and chemists in many consumers' plants and these men have made a study of tool requirements from their own point of view and have naturally acquired some ideas as to what is suitable for their particular conditions. They have been disposed to specify by analysis, in many cases, and purchasing departments have assumed that analysis was about all there was to be considered.

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Taking 1900 as a dividing point in steel metallurgy, the period since then may fittingly be called the Alloy Age.

Introduction of high-speed steel and of the electric furnace are the outstanding events responsible for the progress of the last 30 years.

First electric steel-making furnace was installed in Syracuse, N. Y., in 1905.

Demand for superior steels for dies and tools resulted in the development of tungsten hot die steels. Prior to 1905, there was no oil-hardening die steel.

Results are likely to be better when products are used under perfectly controlled metallurgical direction.

A brand is something more than a name on a piece of steel. It stands for the entire policy, integrity and skill of the producer.

Research in the steel industry, as in others, has for its principal purpose the increasing of profits. Pure science of today is the applied science of tomorrow.

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Analysis Versus Brand

Fortunately, for both producer and consumer, this idea is not so generally accepted as it was a few years ago and in some leading industries there is a tendency to return to the use of material by brands rather than by the use of hard and fast chemical specifications. A brand is something more than a name on a piece of steel. It stands for the entire policy, integrity and skill of the producer and it is something in which the producer may take just pride.

Recently we were furnishing a so-called specification steel to a large consumer and another company was also supplying half of the business. The steel from both sources was furnished as specified to a given analysis, but the hardener could tell which steel he was hardening at any particular time without any designation mark being placed on the tools. In other words, there is an individuality about brands and manufacturing procedure which differs from mill to mill, which represents the accumulated skill in melting, cogging, rolling and annealing or heat treating. That these differences are intangible should not blind us to the fact that they do exist.

Anybody can copy an analysis but to duplicate an established brand is another story. Failing to do so has led to the indiscriminate introduction of alloys where a well made carbon tool steel is all that is needed, in the hope that a dab of this or that alloy will atone for all the shortcomings in steel-making practice.

Progress and Research

WHILE we have stressed various new types of steel that have appeared within the century, I would not have you think that that is the sole reason for progress, but that progress has resulted from the study of materials and physical properties, methods of heat treatment and intensive study of their proper fields of usefulness and, to this end, not only the steel makers but the steel users have contributed and both are very much indebted to those allied industries which have been engaged in perfecting heat treatment equipment, testing instruments and testing methods.

Research, not only in the tool steel industry, but in practically all branches of industry, is receiving recognition and the results of research are now accepted by mill management in a very different way from that at the beginning of the century. The microscope is now generally adopted and has certainly proved its usefulness. X-ray methods have not advanced quite so far in industry but I believe are on their way. Magnetic and electrical testing, volume changes in hardening and tempering and many other refinements are now of daily use in helping us to solve the problems of industry. Hardness testing, I neglected to state, was unknown in 1900, but we now have several generally acceptable and ingenious methods to aid us in the control and uniformity of our products.

The iron and steel industry has not yet delved deeply into fundamental metallurgy. I think we shall have to admit that the users of metals have probably done more along this line than the producers. There

are indications that this situation is changing and that there is a growing appreciation on the part of the great controlling interests in industry that research is both desirable and necessary, and possibly necessity is more strongly stressed than desirability. It is probably too much to expect, in a country such as ours was a generation ago, that research should receive the same attention that it received in European countries. In other words, the necessity was not here.

Research and Profits

Research in the steel industry, as in other lines of manufacturing, has for its principal purpose the increasing of profits. That is what manufacturing companies are for, and all departments of the organization must be so coordinated as to lead to profitable operation. Every department of a company, be it executive, manufacturing, financial, sales or research, must contribute to the one end which brings success—profits.

The research department of a steel company may function in many ways to contribute its part to this success. First, it may endeavor to improve the product, which will lead to greater demand, larger output, greater ability to meet competition and the ability to command better prices. Second, it may direct its efforts to lowering costs (a) by finding cheaper but satisfactory raw materials; (b) by improving old processes to increase yield or decrease labor, or both; (c) by developing new products and finding uses for by-products; (d) by finding new uses for existing products, and (e) by improving operating conditions in the plant not directly connected with the product itself, such as effecting savings in water, fuel, lubrication and electricity and by improving the working cycles, material movements and power conditions. All of these result in public good and bring their reward because they lead to better goods, cheaper goods and the better supplying of the public needs.

Not much exception would be taken to this plan by any board of directors or executives but there would probably be a difference of opinion as to how far research should be extended into the field of so-called pure science in a money-making institution. In my judgment and experience pure science of today is the applied science of tomorrow. I have been impressed many times with the fact that discoveries of supposedly theoretical value soon come to be applied to the practical affairs of manufacture.

It may be a surprise to many of the younger metallurgists to learn that the general adoption of routine chemical analysis, the microscope and pyrometer are all within the memory of men still active in the industry; while fatigue testing, shock and repetitive impact tests, dilatation, conductivity and magnetic analysis as research methods have been adopted by the industry during the latter half of the period outlined.

In Conclusion

I HAVE just repeated some remarks made before the engineering division of the National Research Council nearly 10 years ago and the remarks with which I conclude still apply, notwithstanding the progress made within the last decade. In 1921 I stated that:

> No one of these tests tells us all that we would like to know about steel. They are mutually supplementary; the more we have of them the better, and with all of them in use in the case of steel that fails in service it is sometimes very difficult to answer the question, "Why did it fail?" The steelmaker's questions, in case of failure, are: At what stage of the operation of manufacture or subsequent treatment was the damage done? Was the fault in the raw materials, the melting or pouring, the blooming or cogging, the rolling or forging, or the annealing? Was the steel 100 per cent good when it left the works? Great strides have been made in investigation and research and many new methods of tests are at hand, but the field is not fully covered and in answer to these questions we frequently have to answer, "I do not know."

In each age we are inclined to think that something approaching finality has been reached but, judging the future by the past, we may well assume that future progress will be no less remarkable than has been the progress of the past 30 years.

Rolls for Rolling Steel Shapes

THE minimum diameter of a grooved roll, according to J. Puppe (*Stahl und Eisen*, Oct. 9, 1930), should be at least two-thirds the average diameter of the roll, and the deepest groove should be located as near as possible to the bearings.

The types of mills best suited to rolling shapes are the double 2-high mill and the 3-high mill. The former type permits greater flexibility, and many defects in the roll surfaces can be remedied without dismantling. For heavy sections—for roll diameters greater than 14 in.—ease of application of the necessary handling equipment favors the 3-high mill. Adjustable housings reduce difficulties caused by wear on the finishing passes.

It is of fundamental importance that the grooves be so located that the working diameters of the upper and lower rolls are equal although, with irregular sections, this ideal can not be exactly fulfilled. It is generally best for the pitch line of the rolls to coincide with the center of gravity of the template.

For rolls with working surfaces unequally distant from their respective axes, the author has devised a special drive which acts on the smaller roll only while the mill is running idle. As soon as work enters the mill, friction on the directly driven larger roll causes the smaller one to accelerate, tending to equalize the peripheral speeds. This drive, which was originally designed for thin strips and sheets, has been applied to shapes with the result that the present tendency is to employ the smallest rolls consistent with effective gripping angles.

Dr. Puppe is the designer of a mill for rolling wide flange beams. He has contributed generously to the literature of rolling steel and his writings include observations of practice in this country.

Forces Acting on Roll-Neck Bearings

By W. TRINKS AND J. H. HITCHCOCK

FOR the intelligent design of anti-friction bearings for application to roll necks, the average load to which the bearings are subjected must be known with reasonable accuracy, and the maximum load to which the bearings will at any time be subjected must be known at least approximately. The reasons for these requirements are the following:

Unless flaws exist in one or more of the balls or rollers, the final failure of a bearing is usually caused by fatigue, due to many applications of the average load. A bearing can withstand occasional loads considerably higher than the average load, but its capacity to withstand such loads without injury is not unlimited, and an excessive load might bring about bearing failure. Consequently, we must know the average load accurately and the maximum load approximately.

Five methods are available for determining bearing loads on roll-neck bearings. The first, the use of Brinell balls and plates, is suitable for the determination of maximum loads only. The hydraulic cylinder, second, and the strain gage, third, are suitable principally to determine average loads. The fourth and fifth methods, of comparatively recent development, are the telemeter, or carbon pile, and the electrical condenser. These latter two methods are practically free from inertia effects and may be used to determine either maximum or average loads.

A rolling mill deforms material between the rolls by means of compression. The resultant force exerted on the bar being rolled is the compression force, which acts at right angles to the direction of rolling. This statement refers only to rolling in one single stand, and, in that case, only to rolling at constant speed. If rolling is done at varying speed, forces in the direction of rolling enter into the problem through inertia effects. If the rolling is done in several stands continuously, forces which cause tension or compression in the bar may exist between successive stands.

We must note the small force caused by the friction of the rollers on the roller table, and the small force due to the speed change of the bar, which enters the rolls at a low speed and leaves at a slightly higher speed. Both of these forces are usually less than 1 per cent of the compression force, and can therefore be neglected.

There is an essential difference between the hot and cold rolling of steel, due to the fact that the hardness of steel is very much greater at low temperatures than at usual temperatures of hot rolling. Consequently, much greater average pressures are encountered in cold rolling than in hot rolling, which result in the deformation or flattening of the rolls to a considerable extent.

The average pressure in hot rolling depends upon the following variables: Temperature of bar; composition of bar; compression rate*; internal friction of bar; friction between bar and rolls.

The effect of temperature upon the average pressure has long been known. This is also true, to some extent, of

A PREREQUISITE in designing anti-friction bearings for roll necks is to know accurately the average load to which they are subjected and the maximum load approximately.

Average pressure in hot rolling steel depends on the temperature of the bar, composition of the bar, compression rate, internal friction of the bar and friction between bar and rolls. In cold rolling steel the average pressure depends on elongation from annealed condition, compression rate, composition of bar, internal friction of bar, friction between bar and rolls and modulus of elasticity of the roll (indirectly).

A definite qualitative relation between average pressure and the factors determining it has been found, but some of the quantitative relations are still undetermined.

*The compression rate is determined by the formula draft/(thickness × time) in which the time is that required to pass through the angle of contact. The unit in which the compression rate is expressed is therefore 1/seconds.

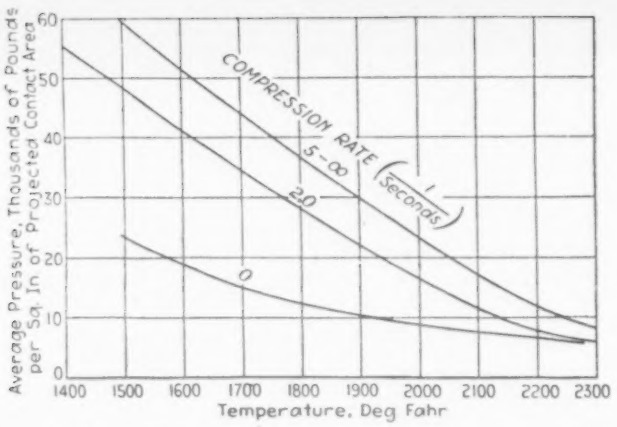

Fig. 1—Relation between average pressure, temperature and compression rate for mild steel, 0.10 to 0.20 carbon, for square sections and values of contact length/thickness less than 1.

the effect of compression. The influences of compression rate and of the internal and external friction are not well known; in fact, the influence of external friction was not even suspected.

Curves in Fig. 1 illustrate to some extent the effect of temperature and compression rate upon the average pressure developed in hot rolling mild steel. The curves apply to sections which are nearly square, rolled with the compression rates indicated. The curve of zero compression rate represents the static resistance to compression. The values used in plotting these curves were taken from "Walzwerkswesen," by J. Puppe.

Curves in Fig. 2 indicate to some extent the effect of external friction. The values given refer to flanged sections and apply to the roughing and finishing passes in the rolling of I-beams, channels and rails. This angle may be defined as the inclination of the inner wall of the flange from the vertical.

As the inner wall of the flange approaches the vertical, the flange angle becomes smaller and the force due to external friction increases. The approximate magnitude of the resulting increase in pressure can be observed in the figures. The curves for which the flange angle is 90 deg. apply to rectangular, almost square, sections, and are the same as the curves of high-compression rate in Fig. 1. Dotted portions of the curves represent data of uncertain accuracy, or approximations which have not yet been checked by test data.

The influence of compression rate upon the average pressure is due to the internal friction, or viscosity, of the bar being rolled. Steel above the critical range of temperature where all hot rolling is being done resists change of shape in the same manner as tar, pitch, clay or plasticene, and its resistance increases with the rapidity with which the change is produced. The compression rate, as indicated in footnote, is a measure of the rapidity with which the change is produced. The resistance to change, or internal friction, therefore increases with increasing compression rates; and, since the force due to internal friction must be overcome by rolling pressure, the latter also increases.

This proportional relation between average pressure and compression rate does not apply, however, to all values of the latter. For values of compression rates equal to or greater than about 5 per second, the average pressure remains sensibly constant. This is probably due to the fact that at high compression rates the bar being rolled is heated considerably, and thereby softened, by the compression.

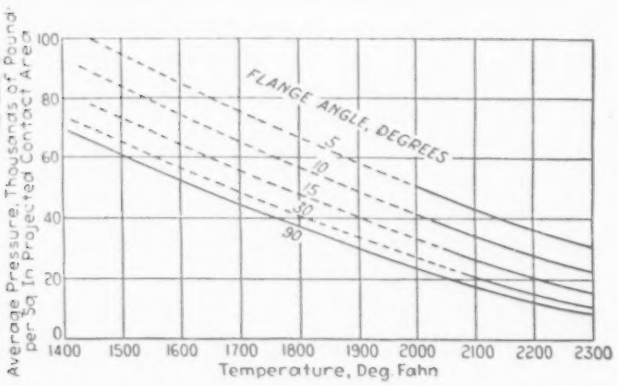

Fig. 2—Effect of friction between the bar and the rolls at high compression rates for mild steel, 0.10 to 0.20 carbon, for values of contact length/thickness less than 1.

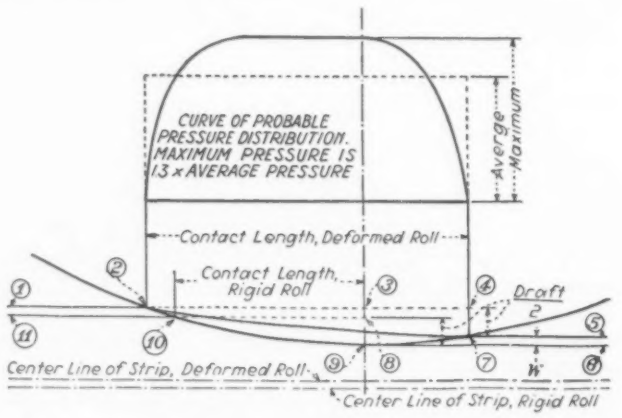
CURVE OF PROBABLE PRESSURE DISTRIBUTION. MAXIMUM PRESSURE IS 1.3 × AVERAGE PRESSURE
Average
Maximum
Contact Length, Deformed Roll
Contact Length, Rigid Roll
Draft
Center Line of Strip, Deformed Roll
Center Line of Strip, Rigid Roll

Fig. 4—Reduction in thickness of the strip by a roll, showing effect of roll deformation.

That the specific resistance to compression does not grow perceptibly beyond compression rates of 5 per second may be doubted by those who have watched the destructive effects of higher and higher speeds, particularly in blooming mills and other heavy mills. However, it is practically certain that the destructive effect of high speed is due entirely to stress caused by impact. If a small but long hot bar is suddenly gripped by the rolls, only the front end is accelerated the maximum amount, because the bar is ductile and can be stretched. If, on the other hand, a heavy ingot is gripped by the rolls and accelerated, practically all of the mass is accelerated instantaneously, which produces enormous stresses.

The effect of internal friction upon the average pressure is very marked in the rolling of thin strips, for the following reason: The surface layers of the bar being rolled, which are in immediate contact with the roll surface, are considerably impeded by that contact from lending themselves to the general change of shape. As a result, a very large part of the deformation must occur within the inner layers of the bar, against the restraining influence of the outer layers. It is at once evident that, as the bar becomes thinner and thinner, a point is reached at which the deformation becomes very difficult. Consequently, the average pressure for rolling very thin

sections is greater than for thick sections, other effects being equal.

Cold Rolling of Steel

In cold rolling steel, the average pressure depends upon the following factors: Elongation from

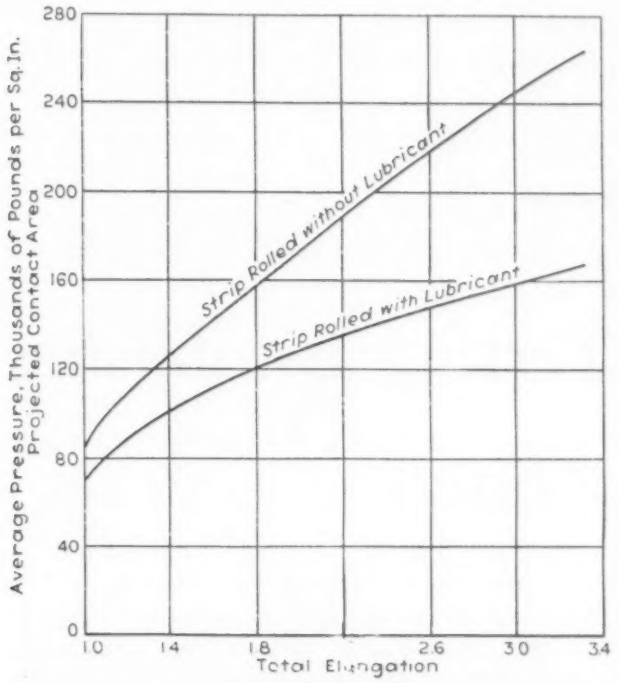

Fig. 3—Effect of friction between the bar and the rolls at high compression rates in cold rolling mild steel (0.10 carbon), based on rigid rolls (compare with Fig. 5), for values of contact length/thickness between 6 and 17.

annealed condition; compression rate; composition of bar; internal friction of bar; friction between bar and rolls; modulus of elasticity of the roll (indirectly).

In cold rolling the rolls are deformed or flattened appreciably. This deformation has a distinct effect upon the calculated average pressure, as will be understood after consideration.

Fig. 4 illustrates in cross-section the reduction in thickness of the strip by a roll. Assume for a moment that the roll remains rigid and that its surface is truly cylindrical, as shown by the arc (10)-(9). A strip, the entering surface of which is represented by the line (11)-(10), is being cold rolled and is reduced in thickness to such an extent that its leaving surface will be as represented by (9)-(6). The reduction in thickness is then twice the distance (8)-(9), and the projected length of contact is the distance (10)-(8).

If the rolling pressure produced in this operation is measured, we can compute the average pressure by dividing the measured load by the projected area of contact. The latter area is, of course, the length (10)-(8) multiplied by the width of the strip. If the width remains constant, the average pressure is inversely proportional to the length of contact. The average pressure calculated in this way for cold rolling steel is sometimes higher than 500,000 lb. per sq. in.

It is apparent that no roll material can remain rigid under such a pressure. From that premise it follows that there must be deformation of the roll.

VARIATION OF POWER REQUIRED FOR ROLLING, AS CHARACTER OF MATERIAL CHANGES

Material				Rolling Temperature, Deg. F.	Ratio of Power Required to That of Mild Steel at the Same Temperature
Fe	Ni	Cr	Mo		
100	..	..	..	2300	1.00
50	50	..	..	2120	1.62
20	63	17	..	2102	2.31
16	62	15	7	2102	3.86
..	80	20	..	2102	3.08
..	100	..	..	2102	1.27

Assume that the roll surface is flattened by some amount W, as shown. To fulfill the same rolling conditions, the draft must be the same. If the leaving surface of the strip is represented by the line (7)-(5), and the new reduction (7)-(4) is made equal to the former reduction (9)-(8), the conditions will be fulfilled, and the entering surface of the strip will be indicated by the line (1)-(2). The probable shape of the deformed roll surface is the curved line (2)-(7).

Contact between roll and strip must now begin at (2), and extend considerably beyond the vertical center line, to (7). The length of contact therefore becomes (2)-(4). From that increase over (10)-(8) it is obvious that the calculated average pressure will become very much less.

Data upon which the curves shown are based are inadequate to complete our knowledge of rolling pressure. A definite qualitative relation between the average pressure and the factors which determine it has been found. The quantitative relations have been found for some conditions, but for a great many conditions these relations have yet to be determined. And this knowledge is essential to intelligent design of anti-friction bearings for roll-necks. Additional test data are required, therefore.

Discussion on Roller Bearings

PROFESSOR TRINKS brought up the point that roller bearings usually fail from the effects of fatigue, except when one of the rollers has a flaw. He thought the roller bearing makers ought to examine their rollers individually, either by the X-ray or by the Sperry electric method, so as to determine in advance that all of the rollers put into an assembly will stand up. Such an examination would

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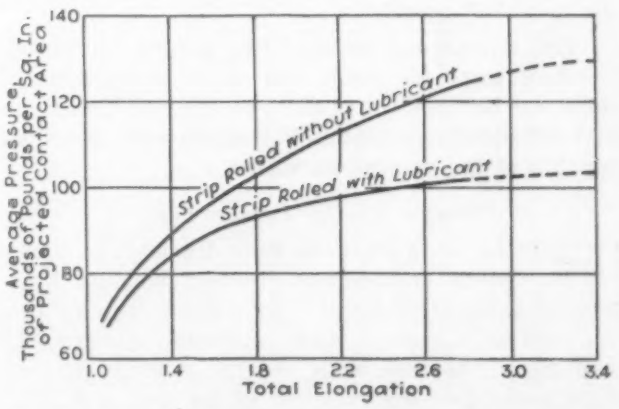

Fig. 5—Effect of friction between the bar and the rolls at high compression rates in cold rolling mild steel (0.10 carbon), based on deformed rolls (compare with Fig. 3), for values of contact length/thickness between 6 and 17.

Symposium on Weld Testing Establishes Important Facts

SUGGESTED revisions of standards for testing welds were discussed in a symposium held at the fall meeting of the American Welding Society.

With the advance in the art of welding, the committee on standard tests of the American Bureau of Welding decided that the present standards adopted in 1921 need a revision in order to provide standardized and simpler procedures for the various mechanical tests in connection with welds.

Three Standard Tests Proposed

In the suggested revision prepared by the committee only three standard tests are proposed: Tension, bending and shear tests. While the committee regarded impact and fatigue tests as desirable for complete information in regard to the mechanical properties of a weld, it doubted whether suitable techniques for these tests have been developed to the point where standard procedures can be proposed. Various controversial questions have been raised as to the value of some of the three standard tests proposed and the correctness of some of the details of the proposed procedures.

The symposium included five papers on various standard tests for welds and much information of value was brought out in these papers and discussions that will aid the committee in preparing an acceptable revision of the present standards.

Proper Use of Tensile Tests

TENSILE tests for welds were discussed by James W. Owens, engineering director, Welding Engineering & Research Corpn. In view of the fact that the weld as a joint is made of three variables—the weld metal, the base metal and the junction between these materials—any valuation of the weld as a joint, he said, should separately determine the properties of each of these variables. The properties of the weld metal obtainable by a tension specimen, he continued, can best be secured by the use of specimens consisting entirely of weld metal. If the test is to determine the properties of the weld produced by a welding process or the properties of welds actually used in the structure, the specimen should be removed longitudinally out of the weld metal of sample welds.

When using the standard specimen for plate material with parallel sides and an 8-in. gage length he had found that, if the weld metal is brittle, the specimen will show where good fusion has been secured and, if secured, will give the ultimate tension stress value of the weld metal, as failure will usually occur through the throat of the weld. A test showed that the notching of a specimen whether of brittle or ductile material will give inaccurate results. If the specimen is of brittle material, the values of the ultimate stress will be very low and, if of tough material, these values will be very high.

Summarizing his data the author recommended that the values of ultimate stress, yield point, percentage elongation and reduction in area should be determined separately for the base and weld metals by the use of round specimens similar to the specifications of the American Society for Testing Materials, using standard specimens for cast materials. When possible the diameter of this specimen should be 0.505 in. and the gage length 2 in. However, where this is impractical, any diameter specimen may be used provided the gage length is four times the diameter.

The author also recommended that the value for fusion for both brittle and tough welds should be determined by a rectangular or round specimen, transverse to the joint with parallel sides and edges, having the weld section locally reduced 25 per cent in width by a curved reduction at the edges of the specimen, the radius of curvature being four times the width of the reduced weld section. Base metals used in preparation of test specimens for welds should have the

Three standard tests proposed as reliable: Tension, bending and shear.

In tensile tests, specimens should consist entirely of welded metal.

Inconsistencies in weld test results are owing to irregularities in the weld rather than to unreliability of the method.

Ductility in welds not usually necessary.

Endurance limits usually one-third of the tensile strength of the weld.

Impact test values of arc welds show that strength of deposited weld metal is greater than that of the weld.

Gamma rays from radium suitable for examining very thick welds—up to 12 in.

same properties as that used in the structure on class of work for which tests are made. A swivel holder should be used for testing the round weld and base metal specimens.

Justifies the Bend Test as Reliable

BEND tests were discussed by W. B. Miller, metallurgist, Union Carbide & Carbon Research Laboratories. The speaker, in defending the use of the bend test, referred to the test of two steels having identical tensile strength, yield point, elongation and reduction in area but widely different impact values. It was found that marked differences in bending resulted. These differences were not as marked as in the impact test, but were sufficiently great to show that the bend test measured some combination of properties not shown by the tensile test. In his opinion ease of testing and lack of elaborate equipment are further justification of the bend test which, he said, showed values not indicated by other tests.

In addition the use of a bend test for many years is indicative of its usefulness. In the speaker's opinion the consistency of the results of the bend test is excellent and constitutes the main advantage. For homogeneous material similar specimens of the same material not only give the same results, but the same material when tested in various thicknesses gives the same results, showing that the test measures inherent properties of the metal. Any inconsistency in results of weld tests may be due to weld irregularities rather than to any unreliability of the method.

The speaker submitted various test results, which he said, with other published data, seem sufficient to warrant the recommendation that the bend test for welds be evaluated by measuring the per cent elongation of the outside fibers rather than the angle of bend.

Ductility Properties Not Needed

Mr. Owens, in the discussion, said that the bend test shows ductility and should be added to the tensile test to show if there is fusion. The discussion showed considerable difference of opinion as to the need of ductility tests. Prof. H. F. Moore, University of Illinois, asked "What do we need ductility for anyway?" Ductility is important, he said, in lower stresses but high ductility is not needed in structural work—not over 1 to 5 per cent to relieve stresses. J. F. Lincoln, Lincoln Electric Co., said there is a tendency toward increasing ductility of welded metal.

Fatigue and Impact Values of Welds

A COMPREHENSIVE paper on fatigue and impact tests for welds was presented by Charles H. Jennings, research laboratories, Westinghouse Electric & Mfg. Co. The writer gave results of a series of tests. Fatigue tests of butt welds were made on small beams, and small and large cantilever specimens of various sizes.

Results showed that the endurance limits differ for different sized specimens and depend on the type of joint. Roughly, the endurance limit is one-third of the tensile strength of the weld. Owing to the fact that different specimens give different values of endurance limits it is difficult, according to the writer, to determine which type of specimen to use for determining these limits. However, on the basis of present knowledge, he believed that the results obtained on small cantilever specimens are probably satisfactory for ordinary joints. The small specimens give fairly consistent results and strength values. For large welds the use of 2¼ in. specimens would be preferable.

Spacing Welded Parts Reduces Strength

Fatigue tests for fillet welds were made on special testing machines with cantilever specimens. These tests showed that these welds fail at the base of the fillet or through the fillet. For given dimensions of welded parts there is a critical size fillet for which failure occurs both ways simultaneously. For weld sizes below the critical value, failure will occur through the weld metal with lower effective strength. For weld sizes above the limiting value, failure will occur at the base of the weld, the strength remaining

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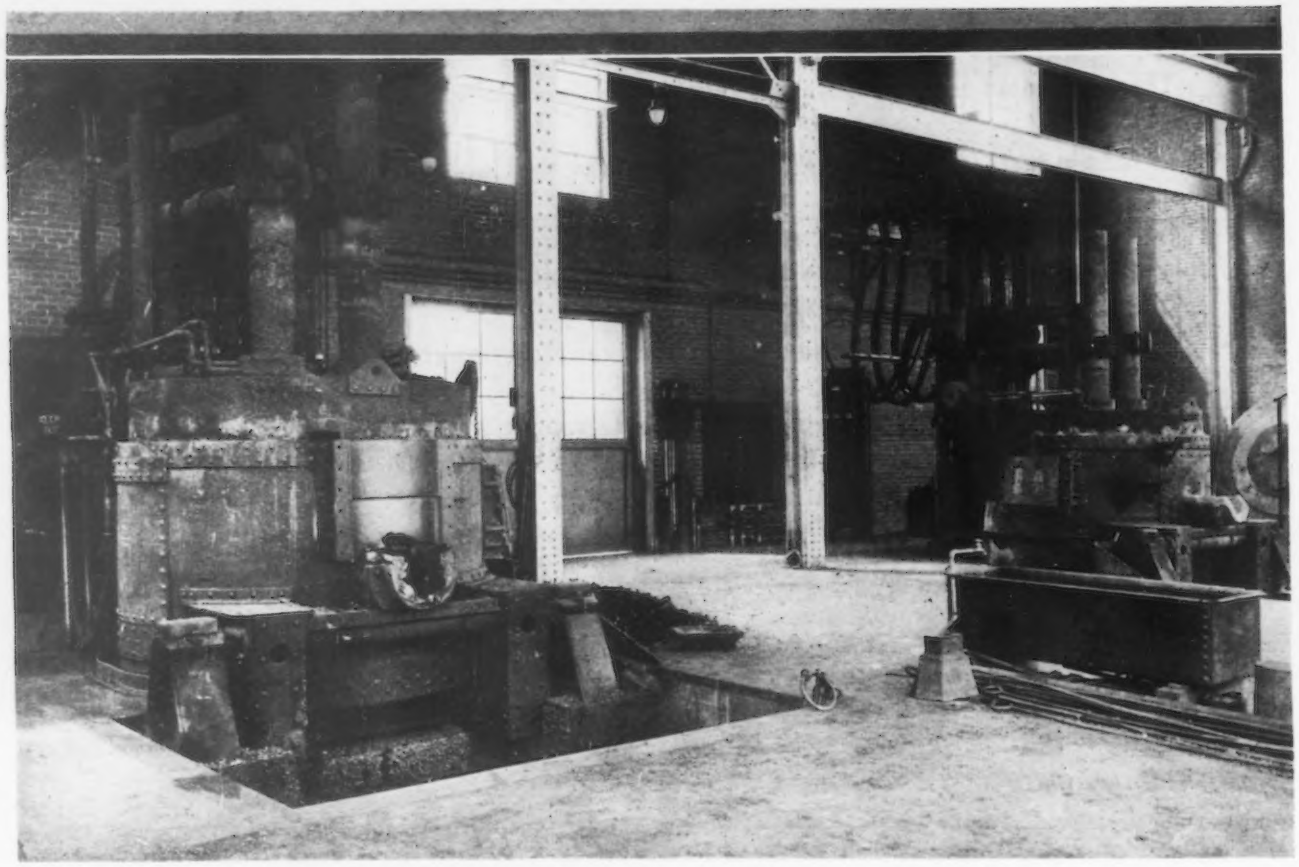

TWO electric Heroult furnaces (2½ tons) supply metal for the foundry of the Lebanon Steel Foundry. Metal from the electric furnaces is transferred in a group of ladles by a monorail system (below).

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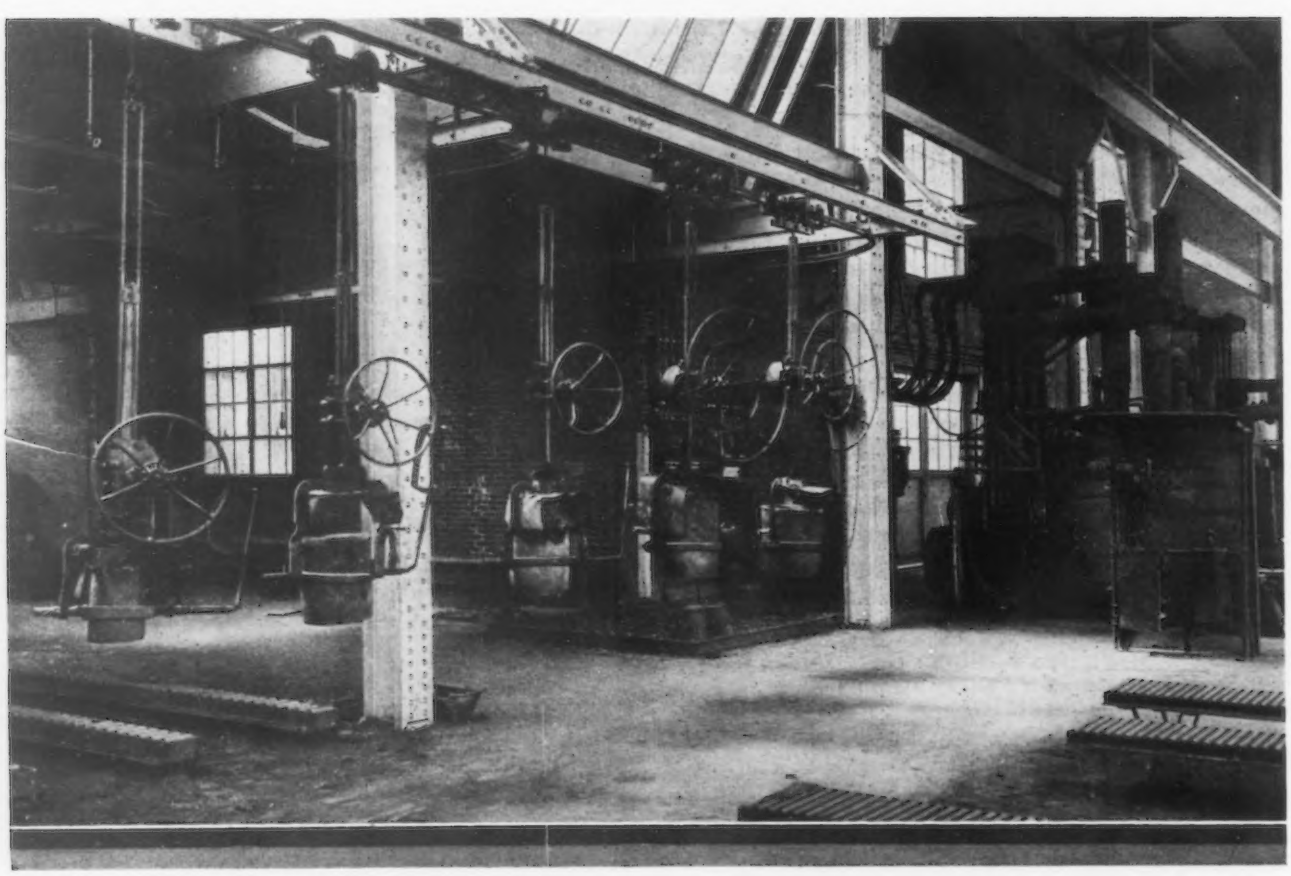


Special Equipment Speeds Output in New Steel Foundry

By EDWIN F. CONE

BELIEVING it possible to lower costs by erecting a new plant, the Lebanon Steel Foundry, Lebanon, Pa., about a year ago appropriated a suitable sum for that purpose. The result is an electric steel foundry which is unique in several respects.

What is regarded as a new principle in foundry construction was adopted—the layout for an established foundry practice was made and the new buildings erected around it. The result is pointed to as a new type of building for foundries and new features in equipment and practice.

Historically this company is somewhat outstanding in the electric steel foundry industry. In 1911 W. H. Worrilow, the president, and T. S. Quinn, the treasurer, built a crucible plant and made steel castings successfully. Foreseeing the value of the electric process, these men decided to adopt it and in 1914 ordered the first Heroult electric furnace in any American steel foundry. After overcoming many difficulties in operating problems, this plant not long after attained a reputation for high-grade electric products and became one of the five plants which now constitute the Electric Steel Founders' Research Group.

Eliminating the shovel completely and erecting a foundry which makes it possible to do in the day turn what was accomplished in a day and night turn formerly are the two features of the new program. Without going into too many details, the installation of materials-handling equipment has been the main factor in this success. The equipment has some features not found in other similar plants.

The ideas of the practical men of the organization were presented to Edwin S. Carman, Inc., Cleveland, foundry engineer, who coordinated the ideas and did the necessary engineering. After the plan had been settled, Wilbur Watson & Associates, architects, Cleveland, designed the buildings. The contractor was Hughes Folkrod & Co., Philadelphia.

BY building a new steel foundry, here described, it has been possible to produce in the day turn as much as was formerly made in a day and night shift in the old foundry.

Modern materials-handling equipment, specially designed, has completely eliminated the shovel.

Very little new sand is now necessary and the old sand travels its regular course virtually untouched by human hands.

All the steel is made in electric furnaces. This company was the first one to install an electric arc furnace for steel castings.

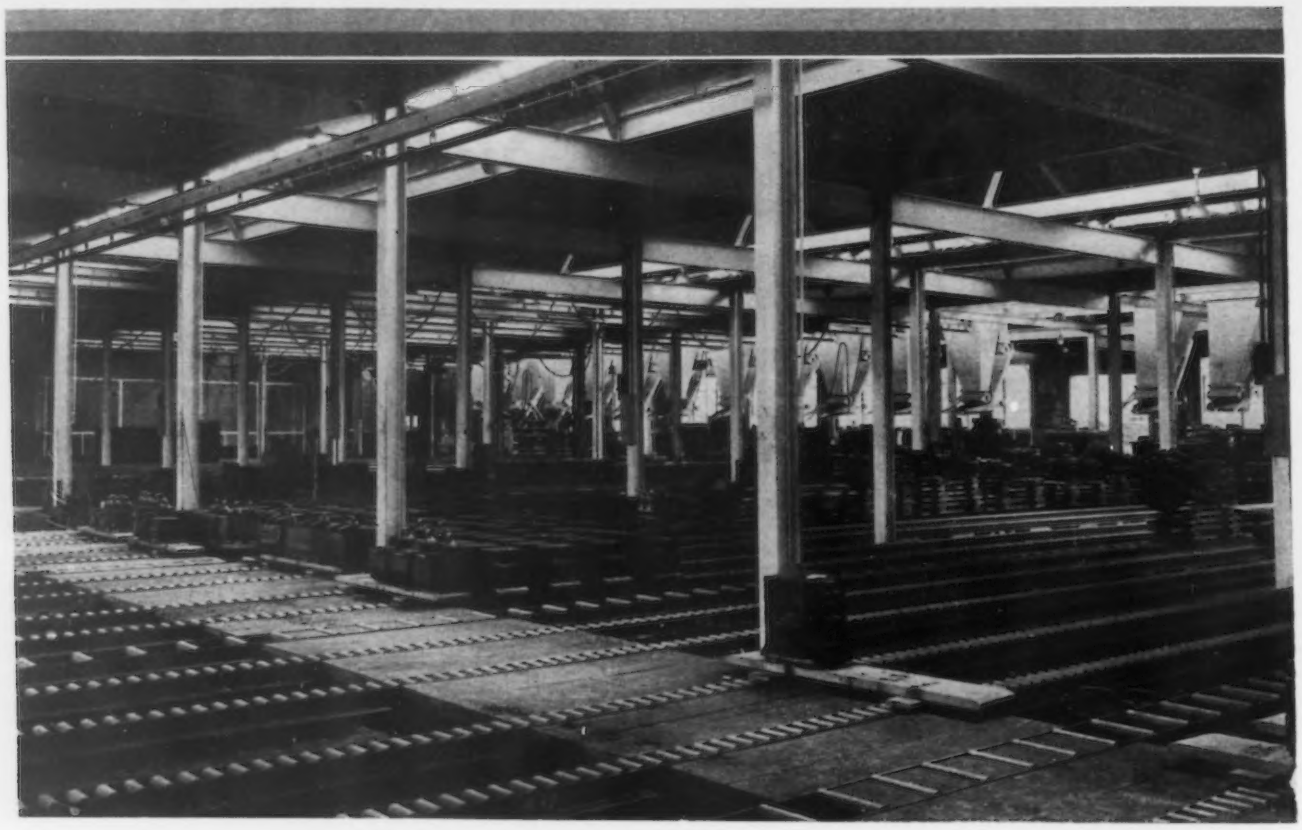
Adequate heat treatment is insured by a unique furnace, the only one of its kind in the foundry industry.

Other features include a novel heating system and special methods of compensating workmen.

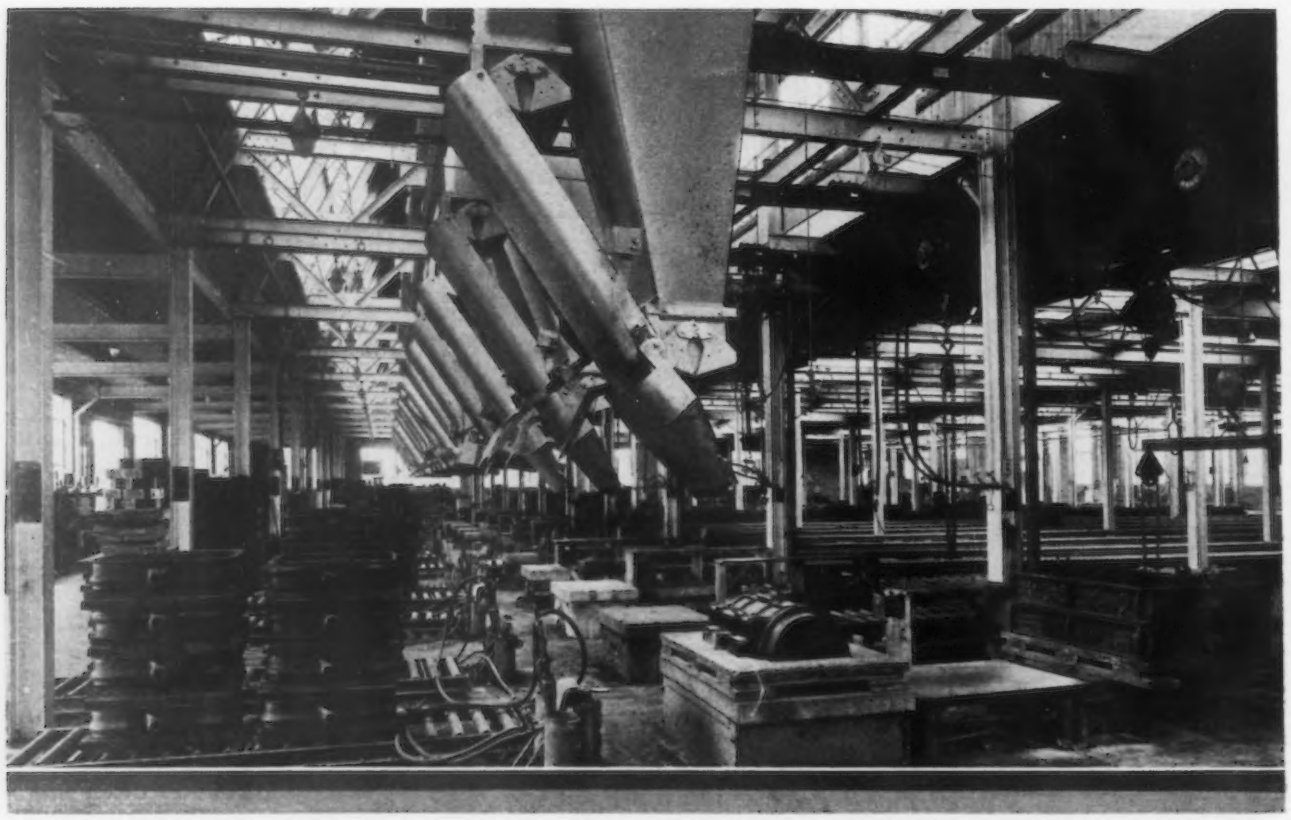
The three main new features of the new foundry are the method of handling and preparing the sand, the molding practice and the shaking out of the castings, the bulk of the product being small castings weighing from less than 1 lb. up to 500 lb., though some jobbing work in larger castings is made for certain regular customers.

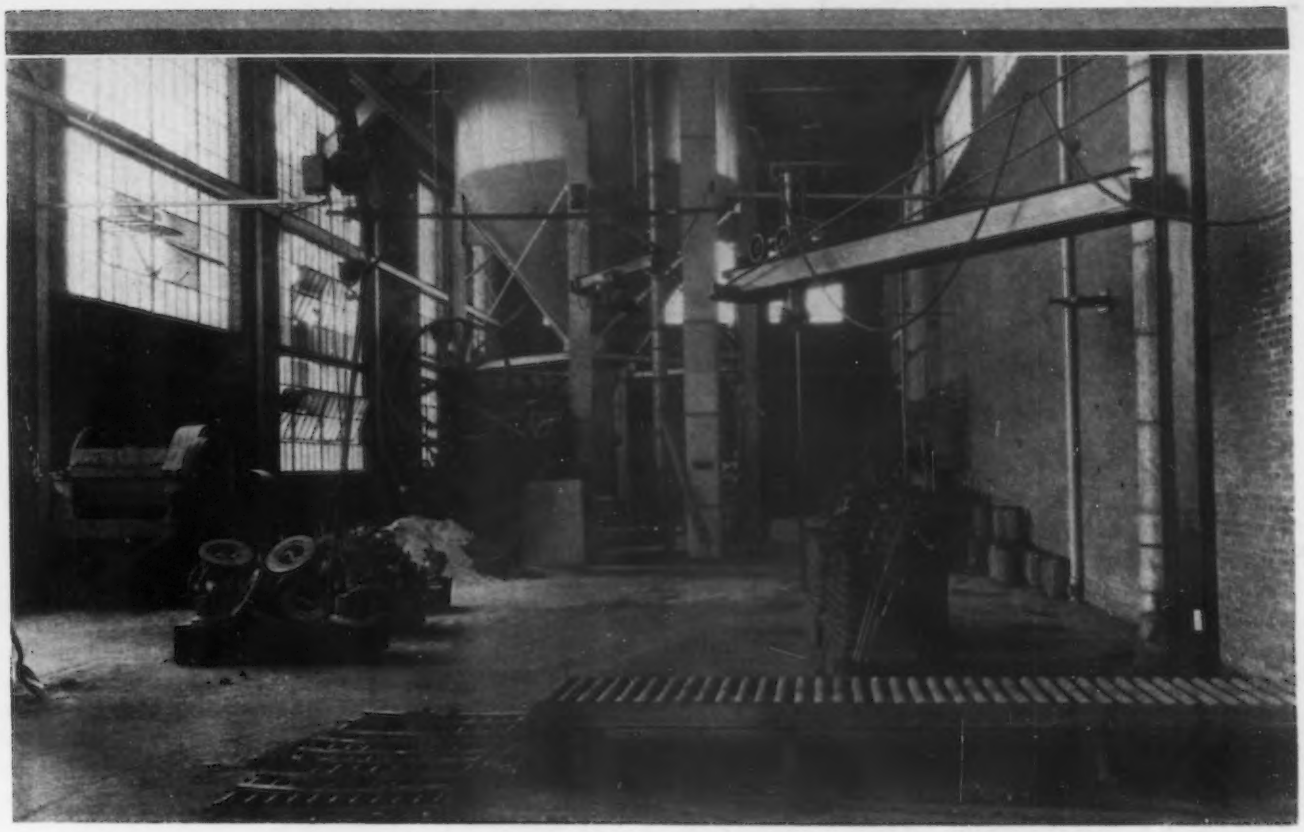
From the time the sand enters the storage yard to the time it is shaken out of the molds, it is hardly touched by human hands. This sand-handling and treating equipment was installed by the Chain Belt Co., and built largely according to the ideas of the designers.

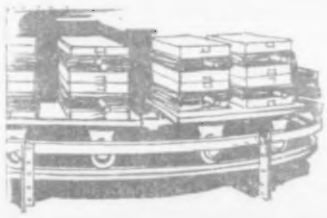
Very little new sand is used in the daily routine. As the used sand from molds and cores leaves the shake-out grid, it is carried by a conveyor belt at one part of which magnetic equipment removes all metal such as nails, core rods, etc. A bucket elevator takes this to the top of a large sand-treating apparatus where a revolving drum breaks up the sand and drops



THE pouring zone into which the molds come from the molding machines. The sand hoppers at the molding machines are in the background. Below—A row of hoppers which deliver sand to the molding machines. Sand, as it comes from the sand-treating department, is delivered to the larger hoppers. The smaller ones contain the facing sand.

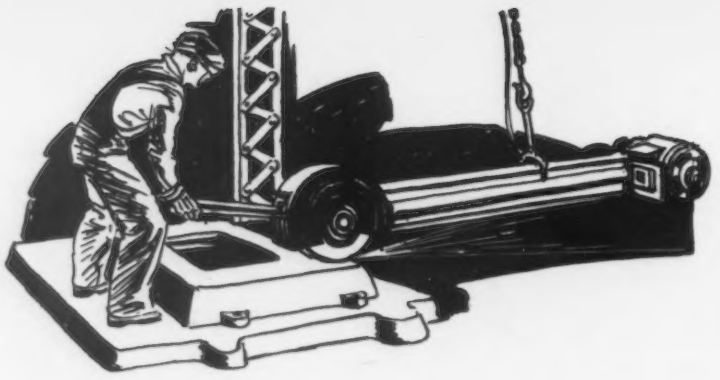






ALL molds, as they come from the transfer car, are shaken out on the grid. The sand falls onto a sand conveyor belt beneath the floor which takes the sand to the sand-treating apparatus, shown in the background. This apparatus is an elaborate and impressive mechanism. At the top are a revolving drum and a cooling plate. Below—Poured molds are transferred by the transfer car at the right to the shake-out grid.

it into a revolving screen. This discharges it on to a revolving plate where it cools as it passes to a large bin. Some of these points are brought out in the illustrations.



A complete ventilating system of the Pangborn Corporation, Hagerstown, Md., removes all dust from the time the castings are shaken out until the sand reaches its final resting place before it is prepared for the molders. New sand required is delivered by a crane to pan mills located under the sand-treating equipment where it meets the treated sand.

Sand from the mill pans is delivered to the molders, at right angles to the course the old sand takes coming to the treating plant, by means of monorail hoists which deliver both new and old sand. These monorail hoists are the Shepard-Niles Crane & Hoist Corporation type made at Montour Falls, N. Y. The equipment for storing both kinds of sand is shown in an illustration—hoppers are located convenient for each molder so that he can draw on his correctly prepared supply as needed. The hoppers and bins were installed by the Bresslar Sheet Metal Co., Lebanon.

Prepared sand having reached the molding department entirely mechanically, most of it has completed a circle. Most of the molding is done by machines. In a row there are 11 plain jolt and jolt roll-over pattern draw machines, furnished by the Herman Pneumatic Machine Co., Pittsburgh. Besides these there are four International Molding Machine Co. jolt squeeze machines. and two Osborn Mfg. Co. jolt squeeze machines. There are 17 bins or hoppers supplying these machines.

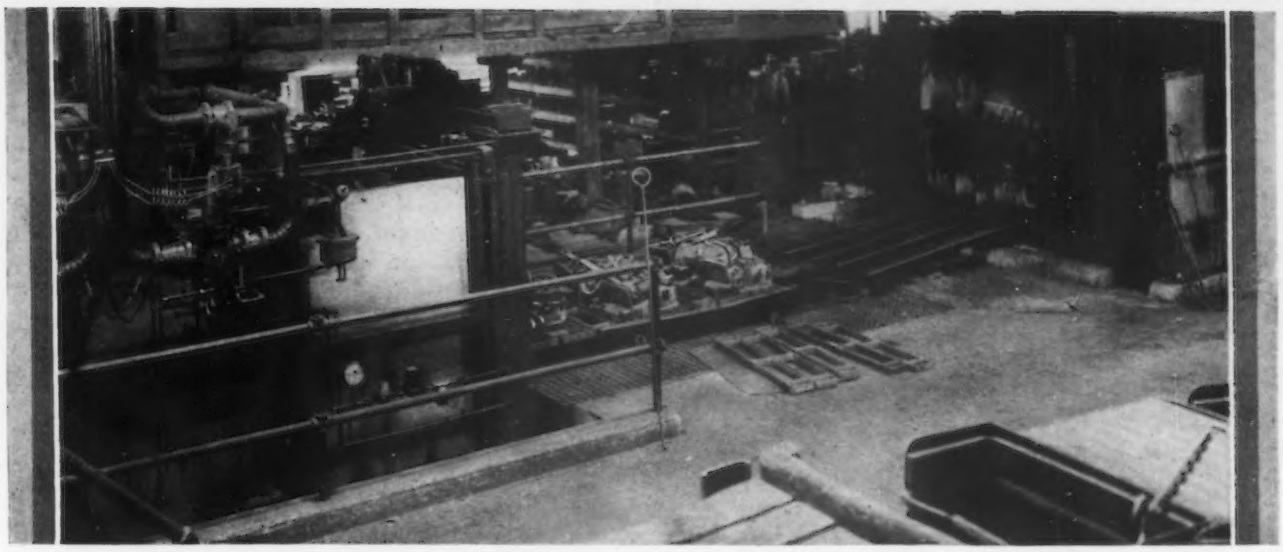
All the work being in green sand, the molds leave the machine and travel on a floor covered with gravity roller conveyors, power-pushed, furnished by the Eastern Corporation of New York. There is 33,000 sq. ft. of molding floor space, including conveyors.

In a so-called pouring zone of the molding department, all the molds are poured as they stand on the gravity conveyors. Proper metal, as specified, is brought from the electric furnaces, close by, by means of monorails and light cranes, furnished by the Modern Pouring Device Co., Port Washington, Wis. The monorail systems are those of the American Monorail Co., Cleveland.

At the proper time the molds are then pushed to a roller conveyor on a transfer car made by Link-Belt Co., Philadelphia, which takes them to the Osborn Mfg. Co. shake-out grid. And this is where we started from in commencing our description of the sand-treating department. The sand has traveled in a rectangle and as it comes back it contains the castings.

The company produces in this foundry plain carbon and some low-alloy steel castings. These leave

Looking down the main bay of the foundry. In this department, special molds are made such as are required for miscellaneous jobbing work.



The push-type, oil-fired, heat-treating furnace for air quenching and drawing, claimed to be unique of its kind in any foundry.

the shake-out grid and go to the cleaning department where they are sand blasted, ground, then pass through the usual routine.

Heat treatment in the majority of cases consists of air quenching and drawing after heating to the proper temperature. A novel furnace, as illustrated, is used, furnished by Ryan, Scully & Co., Philadelphia. It is a push-type furnace, oil-fired, the only one of its kind in the foundry business. Castings are brought to the proper temperature in the first unit, then pushed out into the space between the two units. After the air quench they are all drawn in the second unit. Advantages claimed by the users of this furnace are: 100 per cent treatment of every casting, uniform heating, development of the maximum physical properties of the castings and practically no scale on the product.

Unusual features in compensating workmen are that the grinders are paid on the basis of pounds of material removed—all castings being weighed before and after they have been operated on. Molders are paid on the basis of 1000 cu. ft. of sand rammed, plus certain extras. Both systems work excellently.

The two Heroult electric steel 2½-ton furnaces were moved adjacent to the molding floor of the new foundry from the old. They stand in the main bay of the foundry. There are two 7½-ton Shepard cranes in this bay. The capacity of the foundry is 500 tons per month.

A novel method of heating the plant has been provided. The Lee system is used in the new foundry—a tubular boiler, oil-fired, through which air is blown—installed by Dravo-Doyle Co., Pittsburgh and Philadelphia. The hot air is conducted through four main ducts under the floor, each duct having outlets or branches. Flowing from suitable outlets at proper locations, the heat is ample. A complete sprinkler system is provided and General Electric drinking water cooler units are located at convenient places.

In one portion of the old foundry two 1000-lb. Ajax high-frequency electric induction furnaces and one small experimental furnace have been installed. With this equipment the company is in a position to make both arc-furnace and induction-furnace steel castings of plain carbon, low alloy or high alloy, for a great variety of purposes. The completion of its improvement program represents the materialization of research undertaken three years ago and signalizes the entrance of the Lebanon Steel Foundry into the alloy steel casting field on a commercial scale.

A comprehensive array of experiences in metal cutting operations in which stellite was the cutting medium forms the basis of a paper presented to the American Society of Mechanical Engineers by W. A. Becker and E. E. Gordon, sales engineers of the Haynes Stellite Co., Kokomo, Ind., and W. A. Wissler, metallurgist, Union Carbide and Carbon Research Laboratories, Inc. The authors submit a large number of instances to indicate that the use of the stellite results in increased production and increased life per grind. They tabulated the maximum and minimum figures for different materials, as given in the following table.

	Increase in Production, Per Cent	Increase in Number of Pieces per Grind Time
Cast Iron:		
Milling	25 to 100	2 to 5
Boring	25 to 110	2 to 6
Turning	20 to 140	2 to 5
Mild Steel:		
Milling	25 to 35	2 to 3
Boring	30 to 120	1½ to 5
Turning	15 to 125	1½ to 6

Twenty Alloys for Gray Iron

By E. K. SMITH AND

H. C. AUFDERHAAR

Metallurgists, Birmingham, Ala.

WHILE nickel is usually connected with chromium, it has perfectly definite properties when used alone, and in many cases the addition of other alloys is not necessary, or desirable. An enormous amount of research has been done on the use of nickel in cast iron, by investigators in this country and abroad, with remarkably uniform results.

Nickel

IN general, nickel acts as does silicon, as a softener, although from two to three times as much nickel must be used as silicon to obtain the same softening. It acts to break up carbides, reducing chill, separating out graphitic carbon and softening the iron. It has the opposite effect on the pearlitic matrix, making finer pearlite, then changing pearlite to sorbite, to troosto-sorbite and finally to martensite, thus hardening and strengthening the matrix.

Guillet, *Comptes Rendus*, Vol. 145, 1907, page 552; Piwowarsky, *Hochwertiger Grauguss*, 1929, page 295; Merica, Handbook. A.S.S.T., 1930, page 326, and Wickenden and Vanick, *Trans.* A.F.A., 1925, page 347.

In the case of white iron in which the carbides are stable, nickel hardens the iron. (Hanson, *Foundry Trade Jour.*, Nov. 1, 1928, page 319.)

Physical Properties.—There has been a more or less widespread idea that nickel is a strengthener of cast iron—that, to get an iron of great strength, one simply drops nickel in the ladle of iron, regardless of its composition. Such a course as a rule would give negative results, as the usefulness of nickel is not primarily as a strengthener. Addition of nickel to ordinary types of gray iron will have little effect on tensile or transverse strength.

The exception is noted when nickel is added to low silicon mixtures, which otherwise would be weak and brittle or hard, as in this case, physical properties are much improved by nickel. Where special mixtures, with low carbon and silicon are alloyed with from 1 to 4 per cent nickel, very high strength figures are obtainable, but with ordinary low silicon gray iron an increase in physical properties of about 30 per cent may be expected when 1 per cent nickel is added. (Piwowarsky, *Hochwertiger Grauguss*, 1929, page 298)

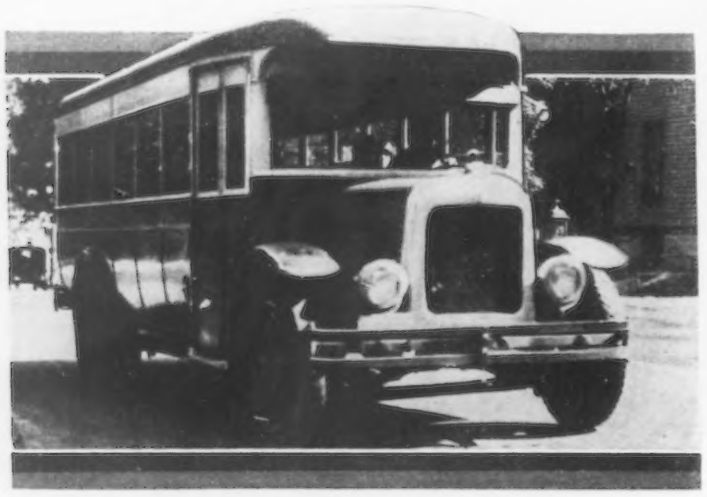


*Table III—Effect of Nickel on Strength of Iron**

Nickel, Per Cent	Transverse Strength, Lb.	Tensile Strength, Lb. per Sq. In.
Without nickel	3,390	21,900
0.67	4,100	32,600
1.23	4,510	31,900
3.88	4,290	33,300

* "Improving Gray Cast Iron with Nickel." No. 202. International Nickel Co., page 8, table 3.

Nickel has a practically negligible effect of shrinkage, melting point, fluidity and contraction. (Merica. A.S.S.T. Handbook, 1930, page 326.)

Hardness.—In suitable cast irons, where silicon is not too high, additions of nickel from 0.25 to 5 per cent increase Brinell hardness from 10 to 100 points. This is not by in-

creasing carbides, but by increasing the hardness of the matrix pearlite to sorbite. (Wickenden and Vanick, *Trans.* A.F.A., 1925, page 347.) One of the most valuable properties of nickel in cast iron is to reduce the Brinell hardness differential between light and heavy sections. It is a source of considerable trouble in high silicon cast irons, that the very light sections may be hard and almost unmachinable, while the very heavy sections are too soft for strength or wear resistance. By substituting nickel for part of the silicon, the hardness differential between a 1-in. section and a ⅛-in. section was reduced from 200 to 20 points Brinell. (Everest, *Foundry Trade Jour.*, July 25, 1929, page 61, and Everest, *Foundry Trade Jour.*, Jan. 2, 1930, page 8.)

Alloy iron castings are a factor in modern buses

Corrosion and Growth.—Small amounts of nickel apparently have little effect on corrosion resistance. (Everest, *Foundry Trade Jour.*, Jan. 17, 1929, page 47.) Some investigators consider that such additions, if anything, accelerate corrosion. (Everest, Turner, Hanson, *Foundry Trade Jour.*, Oct. 20, 1927, page 47, and Hudson, *Foundry Trade Jour.*, Aug. 8, 1929, page 100.) Nickel retards the growth of cast iron under repeated heatings, slightly, (Piwowarsky and Freytag, *Die Giesserei*, No. 48, 1928, page 1193) or does not have any effect. (Sipp and Roll, *Giesserei Zeitung*, 1927, Nos. 9 and 10).

Austenitic Irons.—As nickel is added to cast iron in increasing amounts, the metal follows the course, pearlite to sorbite, to martensite, to austenite. With 12 per cent nickel, the castings are austenitic but unmachinable. (Turner, *Foundry Trade Jour.*, March 10, 1927, page 212.) With more nickel (16-20 per cent) the iron was austenitic and machinable. (Hanson, *Foundry Trade Jour.*, Nov. 1, 1928, page 319, and Everest, Turner, Hanson, *Foundry Trade Jour.*, Oct. 13, 1927, page 29.) A high degree of corrosion resistance was found with metal containing from 20 to 40 per cent nickel. (Everest, Turner, Hanson, *Foundry Trade Jour.*, Oct. 20, 1927, page 47, and Wickenden and Vanick, *Trans.*, A.F.A., 1925, page 347.)

Procedure.—As nickel readily goes into solution in iron, and is not subject to loss by oxidation, it may be added to the mixture in any convenient way. Where large tonnages of fairly high nickel iron are melted, it may best be added to the charge in cupola in the form of pig nickel, containing about 99 per cent nickel. As the melting point of the pure nickel is about 2650 deg. Fahr. (1455 deg. C.), it would be impractical to add any large percentage to the ladle of ordinary gray iron, as there would be insufficient excess temperature to melt the alloy. However, if the temperature of the iron is well above 2650 deg. Fahr. and less than 1 per cent nickel is to be used, it may be added in the form of shot, never as pigs, preferably dropped in the iron as it runs down the spout.

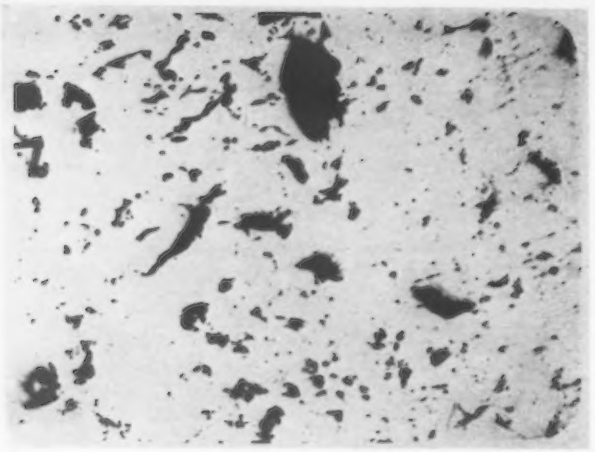
Under ordinary foundry conditions, it is usually better to use "F" nickel shot, which contains 92 per cent nickel and 6 per cent silicon, giving a melting point of 2300 deg. Fahr. (1260 deg. C.). This is readily dissolved by the iron and gives a uniform mixing.

Full instructions for the use of nickel by itself, or with other alloys, can be obtained from the manufacturers but, if the foundryman wishes to experiment, a good starting point is to add 1 per cent nickel, at the same time cutting silicon 0.5 per cent. It is stated that nickel up to 5 per cent and chromium to 1 per cent can be used in cast iron, with the usual pattern allowances. (Wickenden and Vanick. *Trans.*, A.F.A., 1925, page 347.)

It is to be emphasized that in order to obtain desired results by addition of nickel, the iron must be of suitable composition. No benefit will ensue from the addition to an iron with very high silicon or carbon. (Everest, *Foundry Trade Jour.*, April 12, 1928, page 255.)

Advantages.—Properly used, nickel has many advantages in cast iron. Improperly used, it will accomplish nothing. Its greatest value lies in increased ma-

HERE are covered the effects of additions to gray iron of such elements as nickel, nickel and chromium, silicon and other metals. The compilation is a directory also of reference to authoritative discussions in technical literature. By the same authors THE IRON AGE of Nov. 27 carried a similar listing of other alloying elements, which are promising so much for the castings industry.



Nickel gray iron, Ni 2.37 per cent, nodular graphite. Unetched, 100 diameters.

chinability. Its effect is summed up conservatively: "The use of nickel permits of the production of castings, which in comparison with plain castings are:

1. — Either harder, stronger, and of better structure with equal machinability, or

2.—are more readily machinable for the same hardness, strength and structure. (Merica, A. S.S.T., Handbook, 1930, page 326.)

It has been proved that a nickel cast iron with a hard sorbitic matrix, will resist wear far better than ordinary iron. At the same time, very light sections will be machinable, these characteristics being particularly noticeable in such castings as motor blocks, etc. (Piwowarsky, *Hochwertiger Grauguss*, page 303; Turner, *Foundry Trade Jour.*, March 10, 1927, page 212 and Howard, *Foundry Trade Jour.*, Aug. 8, 1929, page 100.) It is stated to reduce porosity in heavy sections and to make the iron denser, therefore to be especially suitable for castings subjected to pressure. (Everest, *Foundry Trade Jour.*, Jan. 2, 1930, page 8; Lowry, *Purchasing Agent*, Nov. 1924, and Everest, *Foundry Trade Jour.*, July 25, 1929, page 61.) There is evidence that elasticity and impact resistance are increased by the addition of nickel. (Galibourg, *L'-Usine*, April 1927, page 26, and Everest, *Foundry Trade Jour.*, April 12, 1928, page 255.)

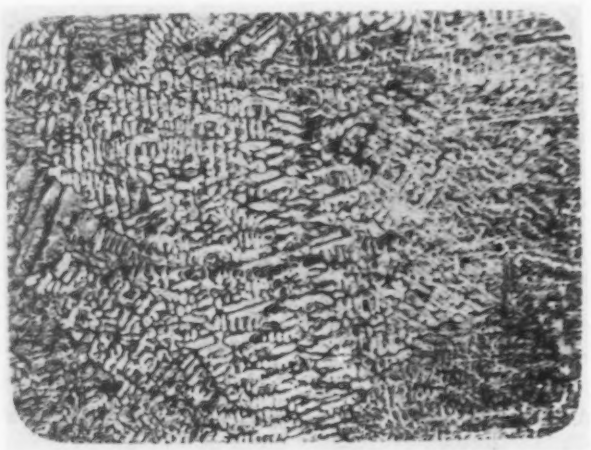
The effect of nickel on cast iron has been summed up by one investigator: Iron liable to chill, is softened. Pearlitic iron is hardened by sorbite. Ferritic iron is not affected. (Hanson, *Foundry Trade Jour.*, Nov. 1, 1928, page 319.)

Nickel-Chromium

BOTH nickel and chromium have definite uses in cast iron, but the combination has been the most popular in this metal, as in steel. Nickel acts as a softener, breaking up carbides; chromium acts as a hardener, forming carbides. Fortunately, nickel neutralizes the undesirable effects of chromium, and vice versa; the resulting cast iron has in general the good effects of both alloys. In other words, the nickel breaks up the excess carbides, formed by chromium and the chromium prevents excess graphitization due to nickel. Both strengthen the matrix.

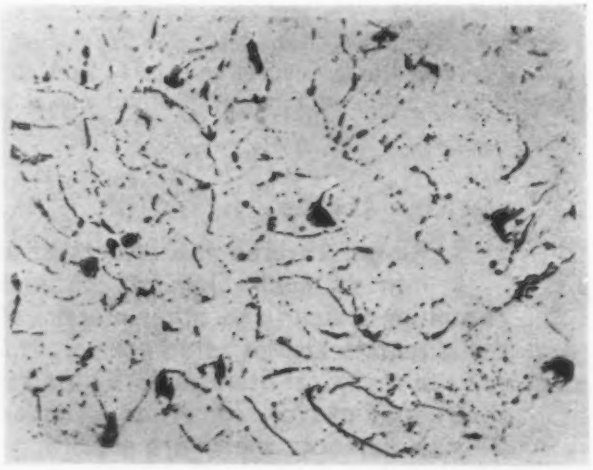
Castings may be toughened and hardened by lowering silicon, or by additions of chromium, and in either case machinability is lowered. (Everest and Hanson, *Foundry Trade Jour.*, Jan. 3, 1929, page 5.) However, it is usually easier to add alloys to the ladle than to lower silicon, which requires a complete change in cupola mixtures. Hence nickel is often added with chromium so that machinability is retained, and at the same time the iron has better structure, increased strength and wear resistance. (Merica, A.S.S.T., Handbook, 1930, page 340.)

Strength.—The addition of nickel and chromium usually effects a decided increase in the strength of cast iron, the degree of increase being governed by the amounts of alloys added, and the original composition of the gray iron. All of which are very well illustrated in Table IV.



High silicon corrosion resistant white iron. Etched, 100 diameters.

Where very great strength is desired, it may be obtained by using special mixtures, producing iron with low carbon, and moderately low silicon, to which nickel and chromium are added. Tensile strengths of from 40,000 to 70,000 lb. per sq. in. are thus obtainable. By similar means, a white or mottled iron may be produced, which will give great strength and some ductility, after a short heat treatment. For example: (Piwowarsky, *Foundry Trade Jour.*, July



Strong chrome nickel gray iron. Ni 0.27 per cent, Cr 0.34 per cent.

7, 1927, page 4.)

	Per Cent
Total carbon....	2.48
Silicon	2.06
Manganese	0.52
Nickel	2.80
Chromium	0.50
Tensile str'gth..	108,000
Brinell	292.

Nickel and chromium also increase shock resistance. (Piwowarsky, *Stahl und Eisen*, Vol. 45, Feb. 26, 1925, page 289.)

Corrosion and Growth.—There is little published data on the corrosion resisting properties of nickel-chrome cast iron. However, there is considerable evidence that chromium aids in corrosion resistance, and that fine grained irons have better resistance. It is therefore extremely probable that cast irons with appreciable proportions of nickel and chromium, are to some extent corrosion resistant, especially in weak acids.

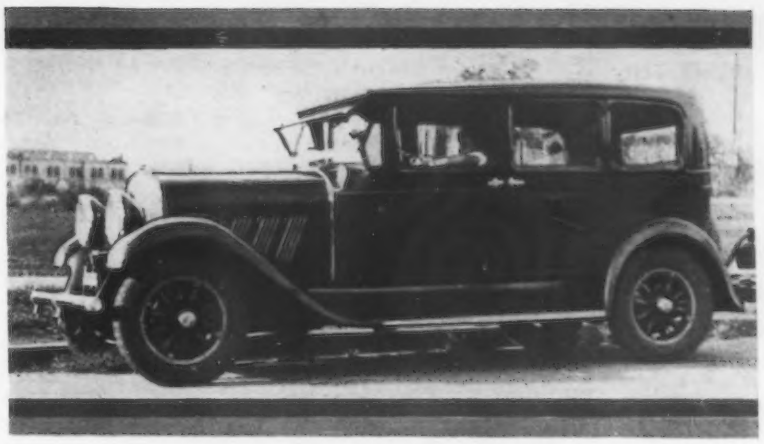
The combination of nickel and chromium together have a very decided retarding effect on the growth of cast iron on repeated heatings. In some cases it is possible to reduce growth to one-tenth that of unalloyed cast iron. (Piwowarsky and Freytag, *Die Giesserei*, 1928, No. 48, page 1193.)

Procedure.—There are a number of satisfactory ways of adding both nickel and chromium, the former being charged in the cupola, or added in spout, or in ladle. As chromium is readily oxidized, melting losses are too high for addition with charge, and the alloy is usually added to ladle. Ferro-chromium (60 to 80 per cent) may be used in crushed form, neither lumps nor very fine dust being taken up uniformly by the iron. Nickel can be added in nickel shot (99 per cent), or as "F" shot (92 per cent nickel, 6 per cent silicon), both supplied by International Nickel Co. Or if preferred both alloys can be supplied together in the form of "B" shot, containing about 60 per cent nickel, and 15 per cent chromium. (Driver-Harris Co.)

A very widespread use of nickel and chromium in small proportions, is in the form of naturally alloyed pig iron made from Cuban Mayari ores. This pig contains approximately:

	Per Cent
Nickel	0.80 to 1.25
Chromium	1.60 to 2.50
Titanium	0.10 to 0.20
Vanadium	0.05 to 0.08

The addition of from 10 to 20 per cent of Mayari (Bethlehem Steel Co.) pig to the charge will give a very fine grained iron, with unusual wear resistance. Where accuracy is not necessary, small amounts of alloy scrap may be added to the charge, but this is uncertain unless the analysis of the scrap is known.



The automobile of today uses alloy iron castings.

The proportion of alloy to be used of course depends entirely on the metal to which it is added, and the result to be accomplished. In general, the alloys should be used in proportion of 3 nickel to 1 chromium. Starting with 1 per cent nickel and 0.35 per cent chromium is often advisable, raising the alloy content until the desired metal is obtained.

Uses.—Nickel-chrome cast iron justifies its extra cost, where special conditions warrant it. Such conditions are: Unusual wear, high temperatures, repeated heatings, corroding influences, abrasion, etc. Locomotive and automotive pistons and cylinders are common examples. In fact, it would be difficult to point out any kind of transportation in which nickel-chrome cast iron is not used.

Austenitic Alloys.—When nickel content is over 10 per cent austenitic alloys are formed which are highly corrosion resistant. (Everest, Turner, Hanson, *Jour.* Iron and Steel Inst., No. 2. 1927, page 185.) Nickel-chromium-copper cast iron is austenitic, non-magnetic, and corrosion resistant. (McKnight. Paper before Am. Iron and Steel Inst., May 9, 1930, page 11.)

Silicon (Over 4 Per Cent) and Sodium

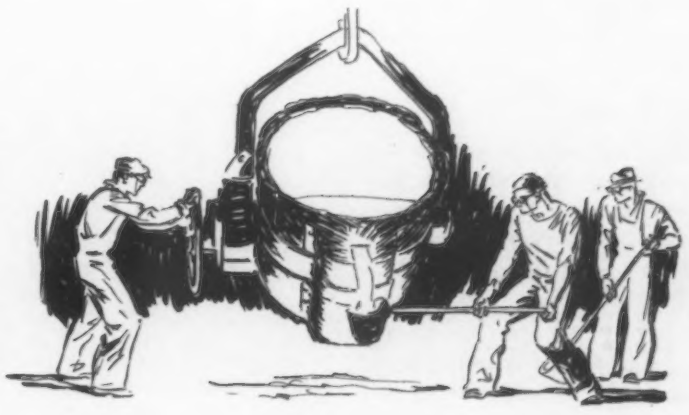
SILICON is of course present in all cast irons, usually in amounts between 1.5 and 2.5 per cent. When silicon percentages range above 5 per cent, the character of the cast iron changes, and silicon may well be considered as an alloy. A summary of the effect of silicon on cast iron is given:

Silicon, 5 per cent, very brittle.

Silicon, 9 to 10 per cent, corrodes more readily than ordinary cast iron.

Silicon, 11 to 14 per cent, becomes corrosion resistant.

Silicon, 14.5 to 17 per cent, maximum corrosion resistance. Hard and brittle. Unmachinable, must be ground. Trade names, Duriron, Tantiron, Corrosiron, Thermisilid, Elianite. (Corson, THE IRON AGE, Sept. 22, 1927, page 797.)



As the silicon range in corrosion resistant silicon cast iron is narrow and foundry practice far from simple, a high degree of skill is necessary. However, the metal is very suc-

TABLE IV—INCREASING THE STRENGTH AND HARDNESS OF IRON BY THE USE OF NICKEL AND NICKEL-CHROMIUM*

Carbon, Per cent	Silicon, Per cent	Nickel, Per cent	Chromium Per cent	Arbitration Bar Tests: Transverse Strength	Deflection	Tensile Strength	Brinell Hardness
Castings with plain iron:							
3.70	2.04	none	none	3000	0.11	23,000	170
Adding nickel alone gives only mild strength increase:							
3.60	2.00	1.00	none	3400	0.13	23,300	183
Adding nickel and chromium:							
3.60	2.02	0.76	0.32	4200	0.13	25,700	187
Adding nickel and decreasing silicon:							
3.60	1.48	1.23	none	4510	0.14	31,900	192
Adding nickel and decreasing carbon and silicon:							
3.10	1.20	3.92	none	5100	0.14	40,000	241

* "Improving Gray Cast Iron with Nickel," No. 202. International Nickel Co., page 9, Table IV.

cessful in strong acids. (Whitaker, *Foundry Trade Jour.*, March 15, 1928, page 189.)

Sodium

While sodium has received little investigation as an addition to cast iron, Prof. Piwowarsky notes that certain cast iron vessels, used in electrolysis, have absorbed sodium, either mechanically or as an alloy. Such pieces of iron even after some months, had not rusted. (Mitt. v. F. Rapatz an den Werkstoffausschuss des V. d. E. Piwowarsky, *Hochwertiger Grauguss*, 1929, page 287.)

Tin and Titanium

TIN seems to have some possibilities as a hardener of cast iron, under special circumstances. (Hamasumi. (*Sci. Reports*, Tohuku Imperial Univ., Vol. 13, 1924, page 138.)

Guillet observed the same hardening effect at room temperatures, but also reports a greatly increased hardness at higher temperatures, which properties may be useful in tools, dies, etc. The addition of 1.94 per cent tin increased hardness at room temperature from about 196 to 500. The same metals at 800 deg. C. (1472 deg. Fahr.) showed 48 (untreated) and 68 (1.94 per cent tin) Brinell. When amount of tin was raised to 4.64 per cent, hardness at 800 deg. C. rose to 126. For such high temperatures, tin up to 5 per cent may be used. (Guillet, *Revue de Met.*, May, 1917.)

Investigators in this country have shown that tin charged in the cupola is not lost, but absorbed by the iron, resulting in lowered transverse and tensile strengths and impact value; 1 per cent tin reduced strength by 15 per cent, and 2 per cent made the castings porous. (Williams, Sims, Newhall, *Foundry.*, Jan. 1, 1924, page 5.)

Titanium and Tungsten

THE action of titanium on cast iron is similar to its action on steel, no titanium remaining in the metal, the whole effect being that of a deoxidizer and possibly a remover of nitrogen. It probably improves soundness, and prevents blow holes. (Moldenke, *Trans.*, A.F.A., 1908, and Treuheit, *Stahl und Eisen*, Vol. 30, 1192.)

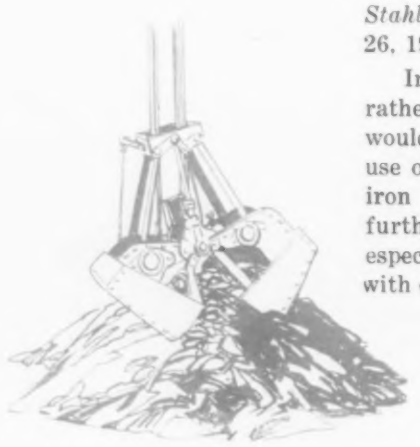
It is possible that titanium increases strength and toughness of cast iron, but there is little evidence published on this point. One investigator found refinement of graphite and believes that the effect of titanium is mostly on non-metallic impurities. (Piwowarsky, *Stahl und Eisen*, Vol. 43, 1923, page 1491.)

The deoxidizing properties of titanium are verified in its action in reducing growth of treated cast iron, as compared to untreated metal, under heat treatment. (Kennedy and Oswald, *Trans.*, A.F.A., 1926, page 871.) Deoxidation with titanium can be effected in the ladle, by adding ferro-carbon-titanium, (Titanium 15 per cent, carbon 7.5 per cent) and stirring as long as practicable.

Tungsten

In earlier researches, Campion stated that tungsten up to 1 per cent had little effect on cast iron, but that 1 to 2 per cent increased strength and shrinkage. Tungsten acts on cast iron as does chromium, retarding the decomposition of carbides. (Hurst, Metallurgy of Cast Iron, 1926, page 165.)

Owing to the extremely high melting point of tungsten (6150 deg. Fahr.), it is necessary to use a ferroalloy, one method being to melt the 80 per cent ferro-tungsten in iron, then add the alloy with reduced tungsten to the ladle. By using this method, tungsten up to 0.5 per cent was added to cast iron with very favorable results. Tensile strength, transverse strength, and resistance to compression, all were increased about 50 per cent, while impact strength increased 83 per cent. Brinell hardness was raised from 161 to 194. (Piwowarsky, *Stahl und Eisen*, Feb. 26, 1925, page 289.)



In spite of its rather high cost, it would seem that the use of tungsten in cast iron would warrant further investigation, especially in connection with one, or more, other alloys.

Uranium is stated to have a strong affinity for both oxygen

and nitrogen and when added to iron in the ladle, apparently raised the temperature of the metal. Additions up to 0.5 per cent gave slight increases in strength, with possible refining of grain. (Foote, *Foundry*, Feb. 1, 1924, page 105.)

A similar investigation reported that uranium up to 0.20 per cent had no effect on shrinkage, fluidity, tensile and transverse strength. (Smalley, *Engineering*, Vol. 114, page 277.)

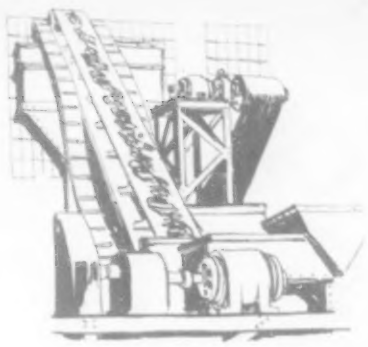
Vanadium

The effect of vanadium on cast iron is to increase hardness, transverse and tensile strength, and resistance to impact. This is especially true with iron containing less than 2 per cent silicon; 1 per cent vanadium increased strength about 60 per cent, and Brinell from 170 to 250. It certainly appears that vanadium has decided advantages in cast iron subjected to wear and shock. (Piwowarsky, *Stahl und Eisen*, Feb. 26, 1925, page 289.)

Similar results were reported by another investigator who considers that vanadium removes oxygen and nitrogen, acting on carbides, and going into solution in ferrite. Vanadium, 0.2 per cent, gave 50 per cent increase in strength, with good deflection, and better wear resistance. (J. Kent Smith, *Foundry*, February, 1909). For addition to cast iron, ferrovanadium (40 per cent) may be used.

Zinc and Zirconium

THE possibility of zinc in cast iron arises from the considerable amount of zinc covered steel and iron, some of which eventually reaches the cupola. It is stated that owing to its rapid oxidation and volatility, zinc could hardly be found in iron. (Hurst, Metallurgy of Cast Iron, 1926, page 135.) Investigators found that 8.22 and 5 per cent zinc added to charge, and part in ladle, had no appreciable effect on the castings. (Williams, Sims, Newhall, *Foundry*, Jan. 1, 1924, page 5 and Smith and Riggan, *Trans.*, A.F.A., 1929, page 51.)



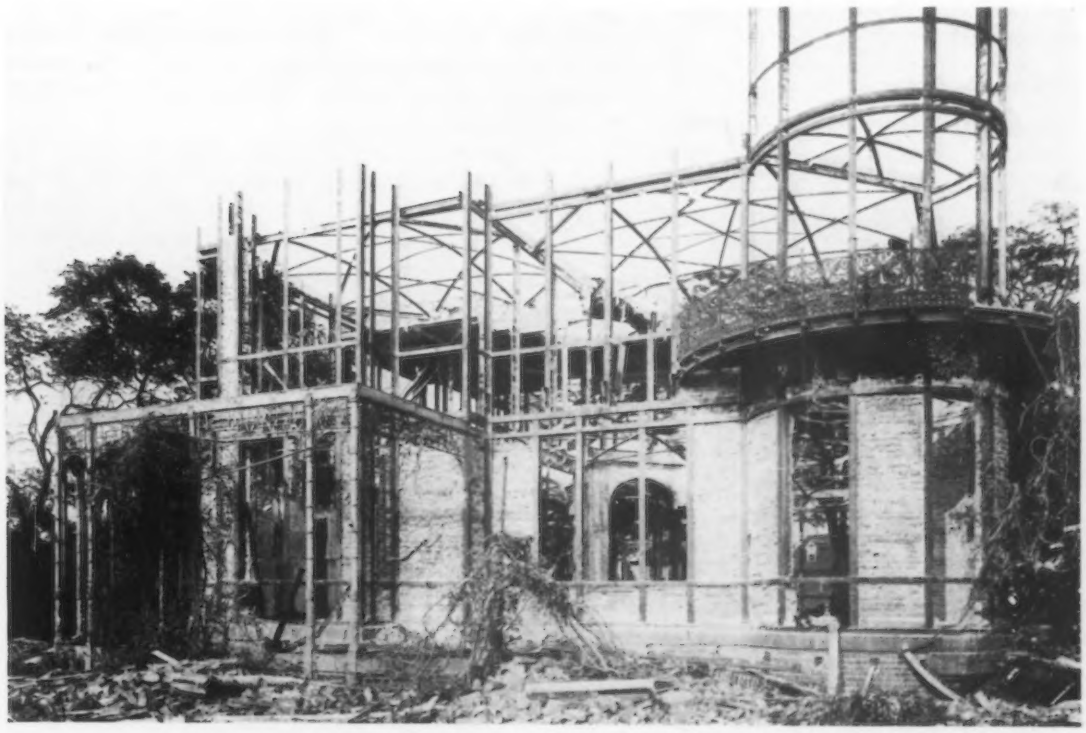
Zirconium

The effect of zirconium on cast iron has been insufficiently investigated to enable one to reach definite conclusions. One investigator came to the conclusion that 0.15 per cent zirconium added 10 per cent to strength, the alloy acting as a deoxidizer. (Moldenke, *Trans.*, A.F.A., 1920, page 391.) Another came to the conclusion that zirconium had no effect on shrinkage, fluidity, transverse and tensile strengths. (Smalley, *Engineering*, 1922, Vol. 114, page 277.) Zirconium is considered to remove both oxygen and nitrogen.

Conclusions

IN considering the past as well as the future of alloy cast iron, one must remember that, while there may be but 15 or 20 available alloys, each one of these may be used in varying proportions to get diverse results. And above all, one must keep in mind the more complex results accomplished by combinations of alloys which are so well illustrated by nickel and chromium. Both of these alloys have many advantages when used by themselves but when added together entirely new and even more desirable results may be obtained.

Hence in cast iron of the future, we may look for many new and valuable combinations of alloys as yet unthought of.



AMERICA'S first steel framed house was built in 1890, at Eighty-eighth Street and Shore Road, Brooklyn, by Niels Poulson. It was razed in September, 1930. The members were joined entirely by countersunk slotted-head bolts. The materials were found in excellent condition after 40 years of service

Over-Extended Capacity for Cold-

THAT the cold-rolled strip capacity of the United States is greater than the market needs warrant is the contention of Stephen Badlam, consulting engineer, Pittsburgh, in a paper read before the American Iron and Steel Institute on Oct. 24, 1930. The ratio of production to capacity in cold-rolled strip is approximately one-half that of the steel industry at large. What follows is quoted from Mr. Badlam's paper:

There are in the country today approximately 2150 stands of rolls devoted to cold-rolled strip steel production, of which number some 400 stands, operated by about 100 producers, specialize solely on the production of flat wire under ¼ in. wide. The potential capacity of the remaining 1750 mills is in the vicinity of 2,000,000 tons a year, as compared with the maximum annual production of probably under 1,000,000 tons.

Price Cutting to Get Orders

As a result of this over-extension, the more efficient units, to maintain their plants at a reasonable level of production, have made concessions in price to obtain business, that was most desirable from a production standpoint. This selective policy has resulted in a general lowering of prices throughout the entire range.

While this situation is unfortunate, it will have a salutary effect in the future, as it will force the abandonment of many of the less efficient units, or their relegation to strictly specialty work.

Vagaries of the Price Level

From the time of the first recorded prices of cold-rolled strip (1917) to the present there has been a comparatively regular decline. Not only has the cold-rolled price declined in common with the other steel commodities, but the spread between the base prices of hot and cold-rolled strip has declined, and both the base price and the spread at a much greater rate than other steel products.

Of still greater significance is the ratio of the price of cold-rolled strip steel to the composite price of finished steel. At the peak of 1920 the price of cold-rolled strip was approximately double the composite price. At present it is only about 12½ per cent above the composite.

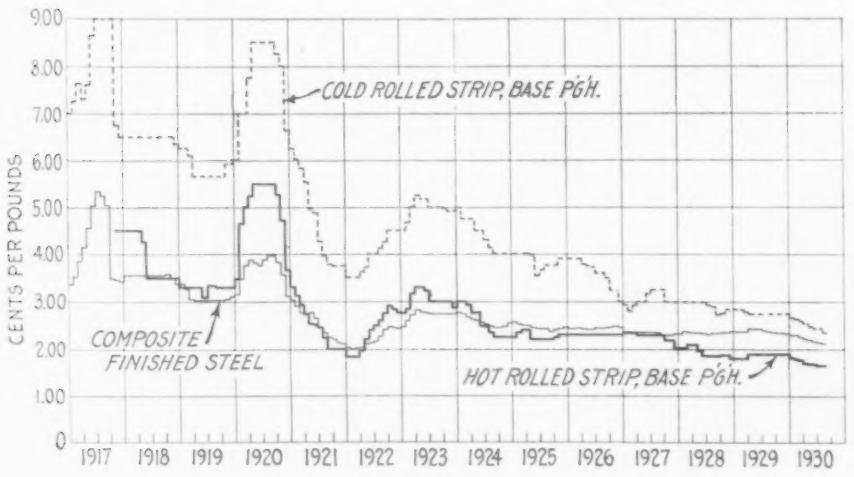
"While the present spread between the hot rolled and the cold rolled is perhaps too small, we certainly cannot expect to see again, under normal conditions at least, a spread of the order of that prevailing prior to 1926.

Assuming that the present spread, or a figure approaching it, will rule in the future, this means that the cold-rolled strip industry will have to adapt itself to conditions radically different from those in existence even two or three years ago. Methods, practices and equipment will have to be discarded which, while quite satisfactory and yielding a profit at a two-cent spread, can hardly be expected to do so at a three-quarter cent spread.

Inconsistencies in Price Structure

The schedule of extras for cold-rolled strip in effect up to 1929 was a relic of times when conditions of costs and markets were radically different from what they are today. As a matter of fact, it dated back, without important changes, to 1917. The present extras, while more nearly reflecting actual costs, still leave much to be desired.

The question of cold-rolled extras involves, first of all, a reasonable and consistent schedule of hot-



RANGE of prices for hot and cold-rolled strip steel, compared with THE IRON AGE composite for finished steel, over the past 14 years. This shows clearly the greatly narrowing margin for cold-rolled products.

Rolling Strip Steel

POOR prices obtained for many sizes and lines of cold-rolled strip steel are regarded by this author as being due to two factors —a great over-extension in capacity and a lack of marketing backbone. He believes that many of the higher-cost units will have to be eliminated, and better adherence to standard products initiated, before much relief will be had. These points were brought out in some detail in a discussion of the entire cold-rolled strip steel situation. The portion relating to the commercial side is here reproduced.

rolled extras. Inconsistencies cannot exist in the hot-rolled schedule without creating a radical dislocation in the cold-rolled price structure. The schedule of extras must, both for hot rolled and cold rolled, reasonably reflect actual costs; otherwise it will not stand the test of competition.

Inconsistencies in the price structure have the effect that concessions are made, in certain ranges of size and gage which yield the greatest profit, by depressing the base price; and such concessions are promptly reflected in ranges which yield little or no profit. Discrepancies in the schedule will work particular hardship to the producers who are non-integrated, or who specialize in a limited range of products, and will be disregarded by the integrated producer, or the one whose range of product is not limited.

These inconsistencies in the price structure have done much toward retarding the proper growth, and depressing the price, of cold-rolled strip steel. They have prevented securing remunerative prices in those cases where they were justified by costs, and where no other products can compete. They have encouraged the competition of other products in the range where costs were low, and where a reduction in the price of cold-rolled strip would have been justified, and would have minimized outside competition.

The schedule of extras should be such that each grade and class of material carries a price on which a reasonable profit can be made, and no one class of material should be expected to carry the burden of a loss in some other class.

Some Orders Are Most Unprofitable

Closely linked with the subject of inconsistencies in the price structure is the question of unprofitable orders. These are orders which are small in quantity, difficult to produce, carrying a heavy scrap loss, and for which a commensurate price is not obtained.

I think that every one familiar with the cold-rolled strip industry will grant that, in every plant, there are certain orders for which the price obtained is such that a reasonable profit cannot be secured, but which are accepted for such intangible reasons as maintaining the good will of the customer, advertising value, and the old excuse that they have always been made for the customer, and the fear that the customer will go elsewhere for his source of supply. Such reasons may have been valid when the price of cold-rolled strip was around $4 for 100 lb., but it is questionable if they are valid at a price of $2.50 and under for 100 lb.

It may be noted that the companies most burdened with items of this character are those which are the oldest, and whose traditions go back to the times when the profits in the cold-rolled strip industry were much greater than are obtainable today. A loss on these items, if any at that time, was more than made up by the profit on other, more desirable, business for the same customer. In many cases the desirable business of that customer has been lost, either to some product other than cold-rolled strip or to some other producer at a cut price, and the old company has been left with the unprofitable business.

Certain lines of production might well be abandoned entirely, as not returning a sufficient profit, and which in all probability never will return a commensurate profit. The only alternative is an increase in the price to a point that will either give an adequate return, or will force a substitution of some standard product upon which a profit is to be had.

Although the technical developments of the last ten years have done much toward reducing the cost of the product, changes in marketing have tended in the opposite direction.

Prior to 1920 the consumers of cold-rolled strip steel demanded only a fairly standard product and adapted their processes to more or less standard materials. From 1920 to 1930, however, the demand of all consumers has become one for a more and more differentiated and specialized product, adapted to suit their specialized line of manufacture, and purchased under increasingly rigid requirements as to surface and physical properties. The result has been that practically every order has required a different processing in the cold mill.

It is greatly to be hoped, however, that the pendulum has reached the end of its swing in the direction of specialization, and that the swing has commenced in the opposite direction, toward standardization.

If the industry is to prosper, and furnish consumers with material at the lowest cost, a return to standardization, permitting production in the largest possible unit quantities, is essential.

W. R. HUEY

Accurate Corrosion Test for Chrome-Iron Alloys

CORROSION resistance and other properties of a metal are dependent upon the history that begins the moment the ingredients are charged into the melting furnace. By heat treatment, the alteration of metal performance, whether mechanical or chemical, is toward improvement and, conversely, mistreatment by heat causes inferior performance. A more thorough knowledge of the effect on metal of temperature, confined to very narrow limits, will ultimately result in even greater improvement of corrosion resistance by existing alloys than that made during the past decade. These statements are from a paper, "Corrosion Test for Research and Inspection of Alloys," by William R. Huey, at the National Metal Congress of 1930. The author is engaged in process research for the E. I. duPont de Nemours Co., Wilmington, Del.

Much of the experimental investigation that has led to the discovery of present-day acid resistance in high-strength alloys has been based on the mixing of metals and is concerned with methods to foster the mixing to produce the alloys, says Mr. Huey. Some work has been done to determine the effect of slight closely controlled variations of the minor elements, or impurities, in the alloys, but this phase of alloy research has been handicapped by the lack of sufficiently exacting test methods for measuring the effect.

Three Lines of Investigation

Attention to the subject of corrosion may be directed along three different but closely related lines of investigation. These are:

1—A study of the fundamental aspects of corrosion, designed to arrive at some concept of the mechanism of the process. Such a study encompasses a wide range of chemical, physical and metallurgical principles, and a thorough knowledge of the relations between them. It is doubtful that a true understanding of the nature of corrosion, in the general sense, can result from the work of an individual. The combined endeavor of a group of workers, each the master of one of the branches of human knowledge mentioned above, will be necessary.

2—Investigation of the reaction of metal corrosion for the specific purpose of improving the corrosion resistance of existing metals, or for development of new metals. This more specialized phase of the subject holds promise of immediate material return of value to industry.

3—The development of a method for predicting the performance of a metal which is to be used under corrosive conditions. This line of investigation is distinct from that mentioned in the foregoing paragraph only in purpose.

The Corrosion Test Described

An experimental investigation of the corrosion resistance of chromium-iron alloys, carried out almost continuously since 1924 in the laboratories of the E. I. duPont de Nemours Co. has developed a corrosion test that fully meets the requirements of the first two lines of research. In this test, carefully prepared samples of the metal are fully immersed for five 48-hr. periods in nitric acid (65 per cent HNO_3 by weight) contained in all-glass apparatus and maintained constantly at the boiling point.

The outstanding characteristic of the test is the simplicity of method by which the many variable factors are eliminated that are known to affect the reproducibility and accuracy of various test results. There is no change in acid strength during the period of the test, provided sufficient cooling water is passing through the reflux condenser on the flask. The constant boiling concentration of the acid is further insurance against change in strength. Sufficient volume of acid is used so that change in strength is negligible, due to chemical reaction with the metal. The necessity for providing a known supply of oxygen to the

solution is avoided by eliminating oxygen in the boiling.

The testing apparatus consists of a flask, fitted with a reflux condenser, integral with a ground glass stopper. In the wall of the stopper are glass hooks for hanging the glass rods supporting the specimen in the solution. The heat is supplied by a three-burner electric hot-plate having low, medium and high adjustment. Auxiliary equipment consists of grinding and polishing wheels for sample surface preparation, and a laboratory balance capable of weighing accurately to a tenth of a milligram.

It has been found convenient to use metal samples approximately 1.875 x 0.875 x 0.375 in., with 0.25 in. diameter hole in the center of one end, about 0.25 in. from the edge. If it is preferred, however, there is no objection to the use of a 1-in. diameter by 0.375 in. disk. After machining the surface, the tool marks are removed with 120 French emery, taking care to renew the paper frequently and to avoid too rapid abrasive action, causing heat. After the surface preparation the sample is carefully cleaned, especially of grease or oil. Exact measurement is made for computing the total area, and density is determined by water displacement, if it is not known by previous determination.

About 750 cc. of the acid are placed in the flask and the weighed specimens immersed to a depth which prevents contact with the bottom of the flask and at a distance from each other which prevents contact with each other or the sides of the flask. After placing the reflux condenser and starting the cooling water through it, the hot-plate switch is set to "high." When the acid begins boiling, the switch is set at a point where boiling will be maintained. It is possible to test three samples in one flask but different metals should not be tested together. After 48 hr. have elapsed the samples are removed, quickly washed in water, thoroughly dried and weighed. The chromium-iron and chromium-nickel-iron alloys should be tested for five 48-hr. periods, which is ample time for a constant rate of development.

The corrosion rate for each 48-hr. period and progressively for the entire 240 hr. can be calculated from the determined data as inches penetration per month, which is the method of expressing results taking into account the density of the metal. The formula used for calculating this value is $R = \frac{43.9\,W}{A\,S\,T}$ where W is weight lost in grams; A is area in square inches; S is density, T is time in hours and 43.9 is a factor converting cubic units to linear units and hours to month.

▲ ▲ ▲

CORROSION resistance of chrome-iron alloys has a definite relation to structural condition as influenced by heat treatment. Further improvement, especially in the acid-resistant alloys, seems to hinge on a slight variation in chemical composition and closer control of heat treating temperatures. To evaluate the effects of such minor changes it is necessary to use a corrosion test capable of producing consistently accurate data. A test developed in the laboratories of the E. I. duPont de Nemours Co. is described in this article.

What the Results Show

Results of tests show corrosion rates of four samples, each of three different alloys representing a chromium content range of 6.40 per cent. While the extreme difference of rate between low and high chromium alloys is in this case 3650 milligrams per sq. in. per month, the greatest variation in rates for a given alloy during a given test interval is 90 milligrams per sq. in. per month. This occurred during the first period with the 18.2 chromium alloys, which showed a mean rate of 370 milligrams per sq. in. per month. The variation is approximately 24 per cent of the mean rate.

This alloy showed a variation of only 10 milligrams per sq. in. per month at the conclusion of the test, or 3.1 deviation, based on the minimum rate at the beginning of the test. During this period the variation in weight lost for the four samples was 1.4 milligrams, while the weight of samples ranged between 72,930.4 milligrams and 74,077.4 milligrams. Therefore the measurable loss was approximately 0.002 per cent.

It is obvious from these data that the same relation between temperature and resistance holds for each alloy. The greatest variation occurs in temperatures below boiling, which is to be expected on account of the effect of the dissolved oxygen and quiescent acid. However, the variation is between the average of four samples for a 48-hr. test and the average of four samples for a 240-hr. test. The data provide ample testimony in favor of testing at boiling point and for the longer period test.

The corrosion test described reveals accurate quantitative data that represent truly the corrosion resistance of the metal sample in the test acid used.

TABLE I—ALLOYS TESTED

Alloy Designation	Chemical Composition Per Cent Cr	C	Mn	P	S	Si	Rockwell B Range		Tested at Degrees F.
1214A	12.38	0.09	0.35	0.010	0.019	0.24	70	78.5	Room; 256
1214B	12.35	0.08	0.40	0.014	0.023	0.28	72.5	76	200; 230
1516A	15.72	0.08	0.30	0.012	0.021	0.15	75	81	Room; 256
1516B	15.98	0.09	0.35	0.010	0.021	0.28	78	78.5	200; 230
1619A	18.20	0.09	0.38	0.013	0.016	0.24	79	84.5	Room; 256
1619B	18.75	0.07	0.37	0.013	0.023	0.26	79	81.5	200; 230

TABLE II—EXAMPLE OF DATA OBTAINED—240 HR. IN 65 PER CENT HNO_3, BOILING

Alloy	Area in Square Inches				Weight in Grams (a) Before Test (b) After Test				Corrosion Rate (a) Inches Per Mon. (b) Mg. Per Sq. In. Per Mon.			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1214A	5.53	5.54	5.53	5.49	74.8025	75.0873	74.5098	74.1874	0.03183	0.03214	0.03133	0.03146
					67.3666	67.5650	67.1904	66.8872	4055	4100	3990	3980
1516A	5.51	5.46	5.49	5.48	73.6128	73.7310	74.3354	74.2250	0.00663	0.00663	0.00671	0.00675
					72.0719	72.2026	72.7805	72.6628	839	834	849	852
1619B	5.45	5.51	5.51	5.48	74.7238	73.5628	73.7692	73.5726	0.00281	0.00272	0.00264	0.00268
					74.0774	72.9304	73.1571	72.9545	356	345	334	339

Purity of Alloy 1214A—7.73
Purity of Alloy 1516A—7.72
Purity of Alloy 1619B—7.69

Interpretation of the data depends upon the knowledge of the metal tested and somewhat upon the knowledge of the acid properties. If erratic results on several samples of the same metal are obtained, it may be safely assumed that these samples have inherently erratic properties.

Symposium on Weld Testing Establishes Important Facts

(*Concluded from page* 1681)

substantially the same except for large welds. Machining a radius at the base of the fillet does not appreciably affect the strength of the fillet. Spacing between welded parts considerably reduces the strength of the weld. The writer pointed out that this fact is of great importance from the standpoint of design practice.

Impact Values Reduced by Annealing

Tests of impact values of arc welds showed that the impact strength of deposited weld metal is greater than the impact strength of a welded joint. Annealing temperatures up to 1550 deg. do not appreciably affect the impact strength of the weld but, when annealing at 1550 deg. to 1700 deg., the impact strength is greatly reduced. The author suggested that this alone might warrant the use of impact tests where welds are annealed at high temperatures.

The author held in conclusion that there is a need for some tentative standard for dynamic tests, especially fatigue tests, because of the extensive use of welds in dynamic structures, although there are a number of problems to be solved before satisfactory standard tests are obtained. The small cantilever specimen shows the most promise as a suitable standard specimen although it may not give satisfactory results for large welds. In the writer's opinion no one impact test can be recommended as a standard at the present time.

Shear tests for welds were discussed in a paper prepared by Andrew Vogel, General Electric Co., and read by R. W. Clark of that company. During the discussion a combination test for tension and ductility was suggested. This would prove one value—strength and ductility. The compression test was also recommended as being good for qualifying welders. F. T. Llewellyn urged that every test be made as simple as possible.

Use of gamma rays from radium emanation to examine thick sections of steel and welds for internal defects was discussed in a brief paper by Prof. G. E. Doan, Lehigh University, with whom R. F. Mehl and C. S. Barrett, Naval Research Laboratory, joined in the authorship. Radium provides a shorter wave length than X-rays, he said, and the gamma rays have the power of penetrating much greater thicknesses than X-rays. The apparatus necessary for radiography by gamma rays is very simple, according to the author. It may consist simply of a capsule about the size of a 22-caliber cartridge containing the radium. The portability of such a capsule will allow it to be used in the top of a sky scraper or other places inaccessible to X-ray apparatus.

The bulb of radium is supported in front of the weld and a photographic film is fastened behind the weld in a light tight envelope. Photographs can be taken through about a foot of steel while X-ray apparatus is usually limited to a maximum of 3½ in. material. On the other hand defects show up with less contrast than when the X-rays are used. The cost of using the gamma rays can be made reasonable, in the writer's opinion. Since the rays are permitted in all directions from the source, time and cost can be saved by photographing a number of specimens simultaneously.

Penetrating Steel One Foot Thick

That specimens up to 11 or 12 in. thick have been photographed by the gamma rays was reported by Dr. Alexander, General Electric Co., who in a discussion commended Professor Doan for the pioneer work he has done in detecting flaws in steel. While he said that it is too early to determine the practical results of the work, he expected that using gamma rays for radiography would be developed to a practical application.

Hot-Blast Stove Heating and Its Equipment

BY HERMANN ILLIES*

IT has been found in Germany that the heating up of the hot-blast stove is possible in the same time as the drawing out of the heat energies from each unit. Hence two stoves for each blast furnace are sufficient, one for gas and one for blast. To take up the corresponding heat quantities, the unit heating surfaces had to be enlarged. In aiming at small dimensions for the stoves and a favorable heat transmission, the speed through the flues was considerably increased, with the result that the resistance became higher.

Due to the enlarged heating surface, an essentially lower waste-heat temperature was reached, so that the draft in the stack became considerably lower or was completely cancelled by the resistance in the flues. Thus, without other equipment, only the gas could be supplied into the stove shaft, supposing that the pressure was high enough. Air for combustion had to be introduced mechanically by separate forced-draft fans.

To get small dimensions for the mains, the velocity of the air must be rather high. This entails a high consumption of energy. Further, the initial costs and the floor space for the fan equipment were very high, which unfavorably influences the efficiency of the plant.

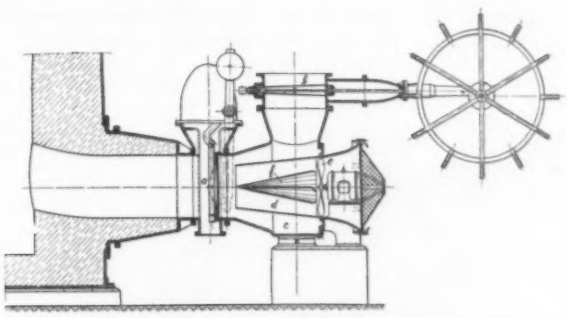


Fig. I

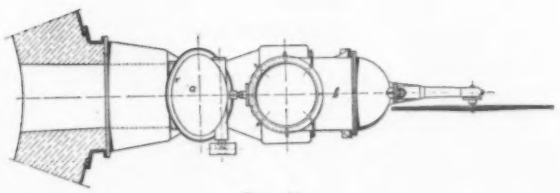


Fig. II

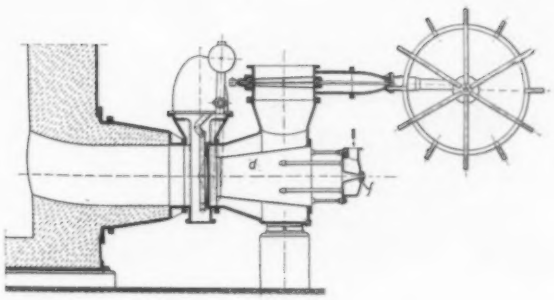


Fig. III

GAS burner for hot-stove applications contains a fan to secure pressures sufficient to maintain high speeds over heating surfaces. For small capacities injectors (Fig. 3) take the place of the fan

The Askania high-efficiency burner, System Stocker-Rein (Zimmermann & Tansen, G.m.b.H., Düren, Germany), takes care of absent or insufficient stack draft, in supplying the necessary quantity of gas and air, and at the same time provides good combustion. Contrary to the old way of supplying gas, the high-efficiency burner supplies a mixture of gas and air for combustion. Also, only a single connection to the stove is necessary.

Figs. 1 and 2 show the burner. The gate valve *a* serves during the blast time as cut-off valve and also for the supply of both gas and air. The gas main is shut off by a second gate valve *b*. Between valves *a* and *b* the burner *c* is situated, with the air inlet pipe *d*, in which the propeller fan *e*, with motor for supplying the air for combustion, is built in.

Speed of the motor can easily be regulated according to the need of air for combustion. The dimensions of the air pipe and fan correspond with the conditions of pressure and quantities. To increase the efficiency of the fan a cone *f* with guide ribs is provided in front of the fan.

For small capacities the burner can be fitted with injectors. Fig. 3 shows this burner in section. An air box *f* is installed into the air pipe, with a number of nozzles. This air box is connected to the cold blast main by a pipe line and the high velocity of the incoming air forces the air of combustion into the stove. The consumption of cold blast is about 2 per cent of the capacity of the blowing engine. By a gate valve in front of the air box the quantity of air for combustion can easily be regulated.

*Amberg Opf., Germany.

To Hold Shop Methods Conference

The shop methods division of the American Management Association has arranged a two-day conference, to be held at the William Penn Hotel, Pittsburgh, Dec. 11 and 12.

The first session, with C. S. Craigmile, general superintendent, Belden Mfg. Co., presiding, will be devoted to a paper on the "Introduction to Shop Methods." Discussion will be led by E. M. Richards, chief industrial engineer, Republic Steel Corpn.

Three papers on the topic of "Organizing for Shop Methods Activities," will be presented at the afternoon session, Dec. 11. These papers, by W. T. Foultz, methods engineer, White Motor Co.; R. H. Maxson, industrial engineer, Armour & Co., and S. M. Woodward, manager of manufacture, C. G. Conn, Ltd., will discuss the topic from the point of view of a large single-unit plant, a large multi-unit plant and a small single-unit plant respectively. W. F. Coleman, vice-president, W. A. Jones Foundry & Machine Co., will preside.

"The Viewpoint of Shop Methods Men," will be discussed at the dinner meeting by T. R. Jones, vice-president, Harris-Seybold-Potter Co., and P. L. Dildine, B. F. Goodrich Co., vice-president in charge of the association's shop methods division.

Sessions on Friday, Dec. 12, will be devoted entirely to the subject of "Process Development," defined as "the procedure for discovering, developing, testing and putting into effect better, quicker and more economical methods for performing a manufacturing operation." Selection of papers "has been made from representative lines of industry, not primarily for presenting the methods of those industries, but for bringing out principles, policies and procedures that are common to all lines of production." Speakers will include E. O. Larson, manager, Syracuse Chilled Plow Co.; G. S. Case, president, Lamson & Sessions Co.; C. E. Stevens, works manager, White Sewing Machine Corpn., and R. C. Bennett, secretary, Sangamo Electric Co.

Power-Driven Rollers Used in Turning Cylindrical Tanks

By ARCHIBALD MURRAY
Engineer, Link-Belt Co., Pittsburgh

WHEN the Pressed Steel Car Co., McKees Rocks, Pa., builder of railroad cars, received an order for 1000 tank cars, it was felt that the existing method of handling tanks was too slow. The company decided to use three sets of power-driven rollers on which to turn the tanks during fabrication. These were furnished by Link-Belt Co., Chicago.

The tanks to be handled were 8 ft. in diameter and 36 ft. long, weighing 10 tons. But, of course, various sizes of tanks can be turned on the same rollers.

On the first set of rollers the tanks are key-bolted on the longitudinal seams, the ends key-bolted in place, and the holes in the longitudinal seams are reamed, the reamer being located in a cage overhead. The longitudinal seams are then riveted.

On the second set of rollers the tanks are reamed and riveted on the circular seams.

On the third set the domes are riveted on, and other fittings are added.

To drive the rollers a motor of 2½ hp., 1200 r.p.m., with solenoid brake, is used. It is connected to a T-8 Link-Belt herringbone speed reducer by a flexible coupling, all being mounted on a welded steel base.

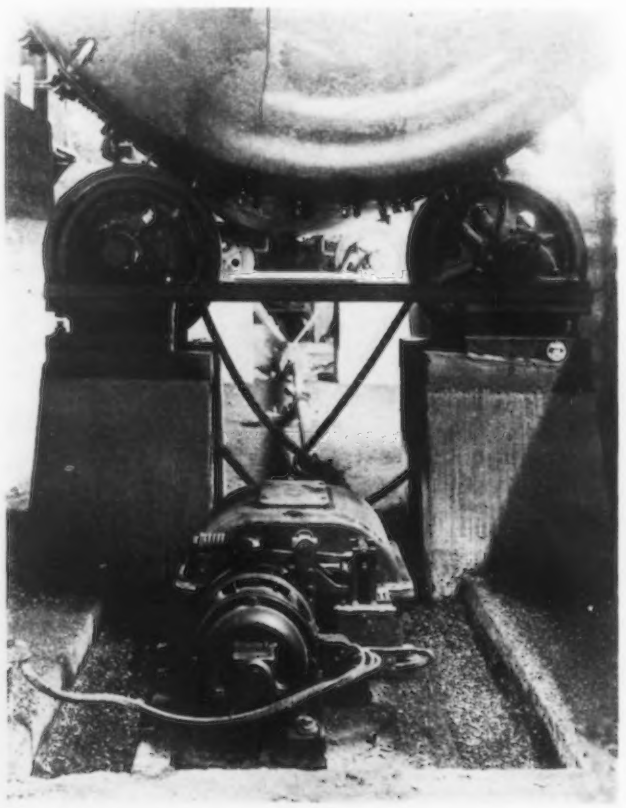
The counter-shaft in the bottom of the pit is driven by the speed reducer through a flexible coupling. The four roller shafts are driven at a speed of 3 r.p.m., from the counter-shaft, by SS-88 chain drives. The rollers are cast steel, 23 in. in diameter, 4 in. wide, on which are pressed 4-in. wide solid rubber tires of the industrial type.

Rubber tires were found necessary on account of the rollers having to pass over the steeple-head rivets in the seams. These conical rivet heads are ¾ in. high, and the steel rollers would not climb over them. This condition was aggravated when attempting to turn the tank, and raise the dome, which in this case weighed about 800 lb.

A reversible controller permits turning the tank in either direction, and the slow turning speed, 20 ft. a minute, enables the operator to turn it a few inches at a time. On the circular seams the holes are reamed three at one position of the tank, which is then turned for the next three.

The bearings on the roller shafts are blocked up, and can be raised or lowered to adjust the rollers for various sizes of tanks. The distance between pairs of rollers is 20 ft.

CAR tanks in process of fabrication are revolved on rolls having rubber tires. The driving apparatus is located in the pit.



THE rolls are of cast steel, 23 in. in diameter and 4 in. wide, and the solid rubber tires are pressed on.

An illustrated 22-page booklet, entitled "Alcoa Aluminum Die Castings," has been issued by the Aluminum Co. of America, Pittsburgh. The numerous illustrations show various products made by this process and the text describes the properties, their corrosion and heat resistance, with a section devoted to die casting design which discusses draft, cores, section thickness and tolerances.

Quality Control, Alloy Contamination in Making Open-Hearth Steel

LAST week some of the mechanical problems connected with the operation of open-hearth steel plants were outlined, (pages 1623 to 1626), as brought out at the Cleveland meeting of the open-hearth operators, under the auspices of the American Institute of Mining and Metallurgical Engineers. In the following paragraphs some of the metallurgical and other features of the work are taken up, as they were developed by the discussions at the technical sessions.

Quality Control in Making Steel

A REPORT submitted by the quality control committee with regard to recommended practice in making killed steel was presented by William C. Kitto, open-hearth superintendent, Pittsburgh Steel Co. Heats made for about 0.10 per cent carbon, he said, should be deoxidized in the furnace.

To this end about two-thirds of the entire manganese addition should be put into the furnace and, if sulphur is to be added to the heat, about half of the silicon and aluminum additions should go in before the sulphur, and then the rest after the sulphur, as the steel is running into the ladle. A small amount of aluminum added in the extreme top part of the ingot to finish the killing was reported to give good results.

Too small a nozzle and too deep a ladle were said to give turbulence to the steel in the mold, resulting in splashing and a poor surface to the ingot. Steel should be poured at such a rate that an 8000-lb. ingot will be finished in about 52 sec.

Recommends Rolling Practice

This committee attempted to follow the steel through the mill. It recommended beginning blooming with small drafts, turning the ingot 90 deg. after every two passes. Best rolling results were said to be obtained when the ingot starts through the rolls at between 2150 and 2200 deg. High-sulphur steel should be poured "on the cold side" and rolled "on the hot side." But at best this steel is hot short and is apt to crack on the corners.

A fluted, round ingot is somewhat difficult to roll into a rectangular shape, but it can be done with proper guidance and a better steel is reported as a result.

Pouring Must Not Take Too Long

A report from a steel castings company indicated that a certain amount of trouble is being experienced when the pouring of the heat takes an unduly long time, caused by having to pour a large number of small and miscellaneous castings. In some cases this ladle of metal takes more than an hour to pour, and this was reported as giving bad practice. It was found that after about 50 min. the silicon and some of the other elements appear to go back from the slag covering the metal into the steel. A certain amount of phosphorus, operating in this manner, has been found to cause trouble.

Reporting for a steel forging company on killed steel ingots, an open-hearth superintendent stressed the selection of materials of the charge as one of the most important features connected with the work. He stated that any change occurring in blast furnace operation about the time the pig iron is cast spoils the iron so far as making good-quality steel is concerned, even though chemically its analysis may be correct.

This bears out a report made by Dr. Herty, at a meeting several years ago, to the effect that deleterious silicate inclusions increase rapidly at such a time, whereas a furnace working evenly gives much better results, whether it be giving a high-silicon iron or a low-silicon iron.

Recommends Liberal Stirring with Rods

Avoidance of the use of fluorspar in working a heat was recommended, insofar as this might be possible. Continuous stirring of the heat with rods during the entire refining process was held desirable. Heats made in this manner showed a large reduction in the quantity of silicate inclusions in the finished product.

Where alloy steel is being made for forging purposes it is necessary to have both metal and slag hot, for proper diffusion of the alloys, and at the same time to make sure that these alloys go completely through the slag and into the metal, instead of being taken up in large part by the slag.

A paper which was read at Chicago in September before the iron and steel division of the institute was summarized by one of the operating men with regard to tests made on the use of mold wash. Two hundred heats were analyzed in connection with the percentage of rejections of steel from all causes. Cracks caused rejections to the extent of 3.29 per cent. This was reduced, when the molds were sprayed with tar, to 1.13 per cent. For various reasons, however, the company making these tests has substituted graphite for tar as a mold wash.

Percentage of iron oxide in slag to make a good rimming steel was reported upon by one operating man, who stated that the average of 317 heats in his plant showed 17.04 per cent of metallic iron, which works out at about 21.98 per cent of FeO. There was a variance in this from cold-metal charges to hot-metal charges, the former being higher by about 2 per cent than the latter.

Alloy Contamination in Steel

A PROGRESS report covering the six months since the last such report on alloy contamination of open-hearth steel was made by Dr. Charles H. Herty, Jr., of the United States Bureau of Mines. The output of the 19 plants reporting was about 6,600,000 tons in December to February, and 8,700,000 tons in the ensuing four months.

Results averaged on the tonnage basis—that is, weighting them according to tonnage output of plant—showed a slight reduction in manganese; an increase in chromium; a decided increase in vanadium, which was attributed largely to a change in the method of determining this element, the earlier methods not being satisfactory; a slight reduction in nickel; an increase of some size in copper and a reduction in tin, following closer watching of scrap by one of the large companies. These results are shown in the report, both on

Alloy Contamination of Open-Hearth Steel from Scrap Used
(Average Results)

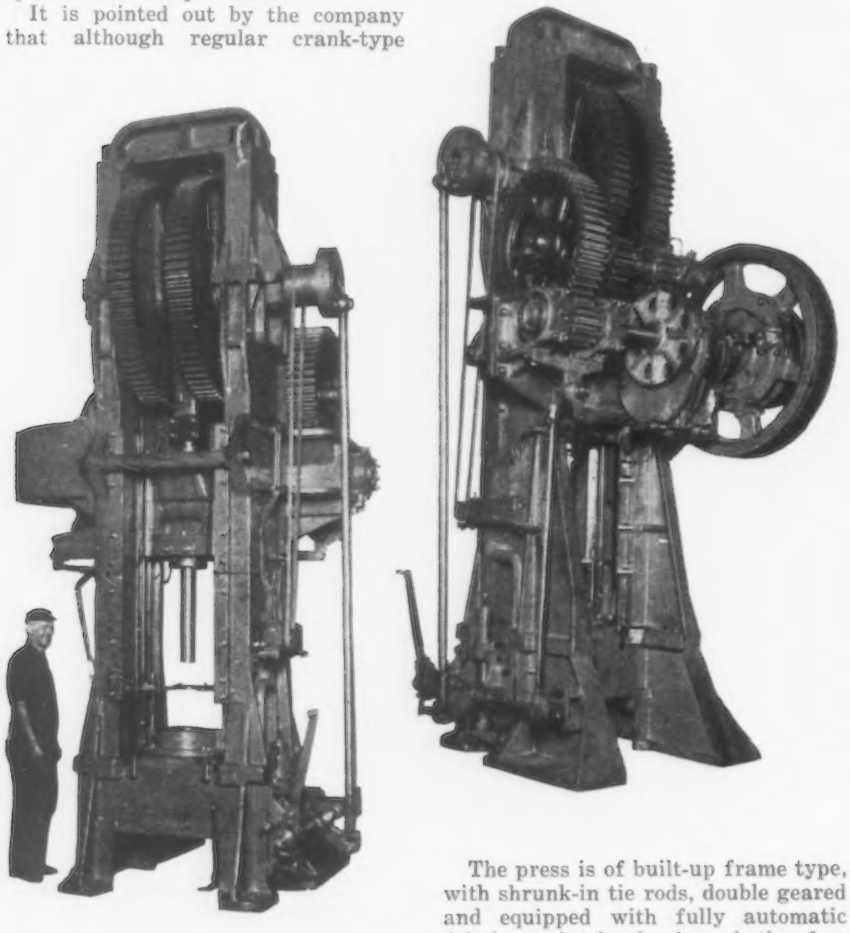
Alloy	December, January, February, Per Cent	March, April, May and June, Per Cent
Manganese	0.20	0.19
Chromium	0.014	0.019
Vanadium	0.002	0.009
Nickel	0.044	0.042
Copper	0.087	0.107
Tin	0.006	0.004

(*Continued on page* 1745)

Long-Stroke Reducing Press Has Drawing Speed of 170 Ft. a Minute

FOR the high-speed redrawing of long brass, copper and aluminum shells, the E. W. Bliss Co., Brooklyn, N. Y., has developed the No. 906 long-stroke reducing press here shown, which among other features incorporates a balanced gear drive. The machine has a 36-in. stroke and operates at 18 strokes a minute; the drawing speed is 170 ft. per min.

It is pointed out by the company that although regular crank-type presses with strokes up to 20 in. have been used successfully on long draws, if longer stroke presses of regular crank type were used the shaft would have to be much larger than necessary for the work because of the excessive twisting moment set up by the long throw of the crank. The press, it is stated, would have to be about twice as heavy as the new machine, and could not operate half as fast.



In the new long stroke press, the twisting moment of the crankshaft is eliminated by applying the driving power to the point where the cheeks would be on a regular crankshaft. In place of the cheeks are two large steel gears connected by a crankpin 18 in. from the center-line of the twin gears. These gears are force fitted to journals which rotate in long bronze-bushed bearings at the point where regular crank bearings would ordinarily be mounted. With torsion removed, the crankpin and main journals do not have to be oversized. A solid one-piece double pinion drives the twin gears from a backshaft. For smoother engagement the two units of the gear train are out of step by one-half a tooth pitch.

The press is of built-up frame type, with shrunk-in tie rods, double geared and equipped with fully automatic friction clutch having both foot treadle and hand lever control, so that the press may be operated by hand in setting and testing dies. The clutch is arranged so that the slide can be stopped or started at any point of the stroke independently of the full automatic mechanism.

Drive shaft and the friction clutch are mounted on Timken roller bearings, the crankpin and other journal bearings being fitted with removable bronze bushings. A mechanical force feed lubricator is furnished with separate piping to all bearing surfaces. A smaller mechanical lubricator is mounted directly on the slide for the crankpin and wristpin bearings. Since, in drawing operations, the work is being done over a comparatively long period of the cycle, often practically from midstroke to bottom stroke, the flywheel must be large enough to give up the required energy to the drawing punch without appreciable "slow down." A large flywheel, 56 in. in diameter and weighing 2300 lb., is furnished, therefore, to minimize the horsepower requirements in keeping the flywheel up to speed.

Dimensions are, in part: Distance bed to slide, stroke down, adjustment up, 16 in.; capacity of press at midstroke, 15 tons; area top of bolster, front to back, right to left, 26 x 23 in.; and floor space overall, 90½ x 99 in. A 40-hp. 900-r.p.m. motor is employed to drive the machine. The weight of the press is approximately 41,000 lb.

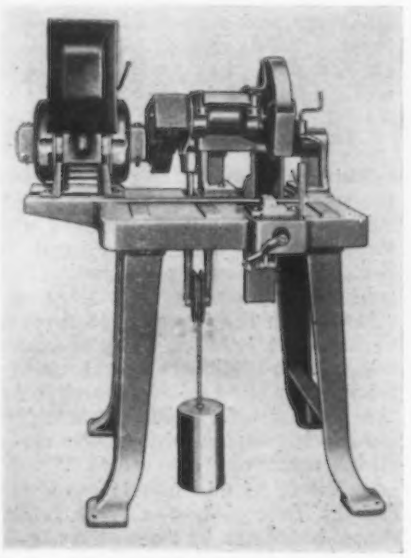
It is stated that even longer strokes than that of the press illustrated are made possible with this direct-geared crank design, speeds of 12 strokes per min. with a 60-in. stroke and 10 strokes per min. with a 72-in. stroke being obtainable.

Abrasive Cut-Off Machine Operates Rapidly

FOR the rapid cutting of carbon and alloy steels, iron, non-ferrous metals, fibre and other materials, Andrew C. Campbell, Inc., Waterbury, Conn., is offering a new abrasive cut-off machine. The cutting is smooth and true, and the material being cut is not damaged by heat.

The work is held firmly in place by a fixture designed to meet a wide range of requirements. Operation is facilitated by arranging the abrasive disk handle so that the operator may use either hand in cutting the material. The starting switch is conveniently located on the motor, and both the belts and the disk are guarded to protect the operator from injury.

The V-belt drive is emphasized as providing smooth delivery of power. Moving parts are balanced. The motor is fastened rigidly to the bed of the machine rather than mounted as part of the counterbalancing arrangement, this is claimed to give smoother operation and to permit use of the most efficient size motor for the work.



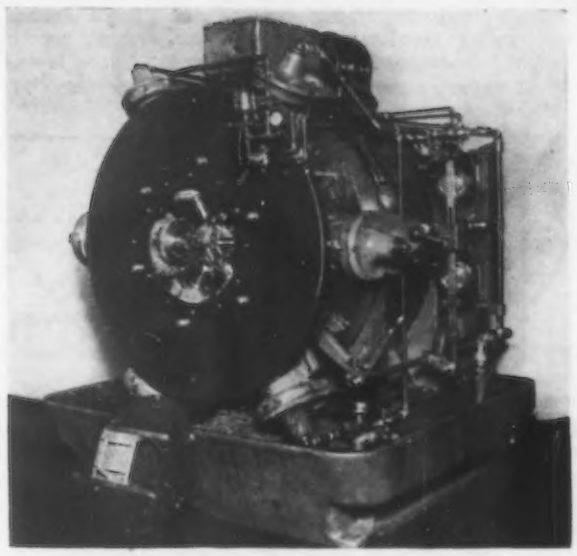
Multiple Turning Machine for Differential Spiders

ALTHOUGH developed primarily for turning three-way differential spiders, the special six-spindle machine here shown can be furnished for machining four-way spiders or parts of similar design.

In this machine, built by the Reed-Prentice Corpn., Worcester, Mass., for a large automobile plant, the feed and indexing mechanisms are Oilgear hydraulically-actuated independently of the main drive. The 15-hp. 1200-r.p.m. main motor drives all six spindles simultaneously. After setting the work in the special jaws of the Logan air chuck, the operator closes the jaws by operating the air valve located conveniently at the upper right-hand side of the machine; when the chuck is closed, he throws the lever at the lower right-hand side of the machine, putting the Oilgear feed mechanism in operation. An interlocking device between the chuck and Oilgear mechanisms prevents starting the feed of the machine until the air chuck is closed.

The three roughing spindles rapid traverse to the work automatically, go into the rough turning feed and, when the rough turning is completed, withdraw rapidly, completing the roughing cycle. Likewise, the three finishing spindles rapid traverse automatically to the work, go into feed and withdraw rapidly, the feed stopping automatically at the end of the cycle. Between the roughing and finishing operations the air chuck is indexed automatically by the Oilgear mechanism. Thus the machine is semi-automatic, the operator being required merely to load and unload the work.

Coolant system can be furnished; the cutting compound is piped to the end of the spindle and feeds down through the turning tools directly on to the work. The weight of the machine, without motor, is 8150 lb.



FEED and indexing are hydraulically actuated, independently of the main drive. The machine can also be arranged for turning four-way spiders.

Rotoscope Enables Direct-Vision Analysis of Rapidly Moving Objects

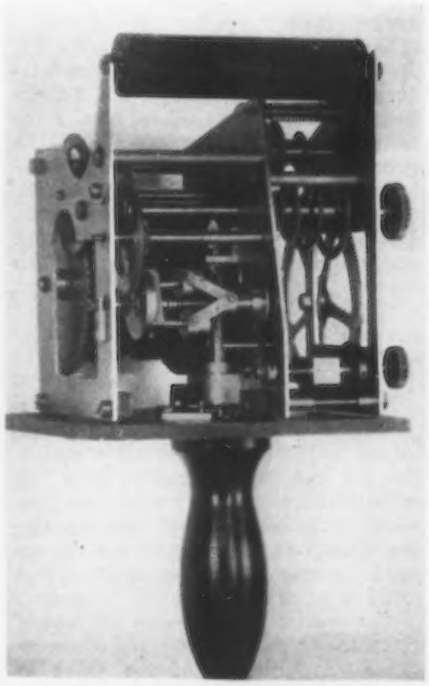
WITH the Ashdown Rotoscope shown herewith, periodic motion, whether rotary, oscillatory, vibratory or reciprocating, can be observed and studied, and the exact speed of the moving object determined without physical contact with the object. It enables slow-motion study and exact timing at any speed from 100 to 40,000 movements a minute.

Slow motion study and exact timing are made without physical contact with the moving part.

This instrument, manufactured in England and distributed in the United States by Livingston & Southard, 17 Battery Place, New York, operates on the stroboscopic principle, by means of which the observer's vision is "geared up" to the speed of any rapidly moving object.

The chief feature is a rotary cylindrical shutter that is capable of giving as many as 1000 glimpses per sec., which blend into a continuous impression on the retina of the eye. The speed of this shutter can be varied by rapid adjustments with a tiny five-speed gear box. Fine-adjustment speed control is secured by means of a special centrifugal governor, accuracy within 0.5 per cent being said to be thus secured.

The instrument is sturdy, compact and weighs only 6 lb. Readings can be made under practically any working condition and without the aid of special illumination. Operated by clock work, as shown, the Rotoscope requires no electrical connections. The operator simply holds the instrument in his left hand with the shutter apertures to his eyes and controls the speeds with his right hand. By setting the speed of the shutter at exactly the speed of the moving object, the latter appears to be absolutely stationary; its speed can then be read on the side of the instrument. By increasing or decreasing the shutter speed slightly, slow-motion studies can be made. Applications of the Rotoscope



A feature of the Rotoscope is the rotary cylindrical shutter which gives up to 1000 glimpses per sec.

include study and timing of gears, ball and roller bearings, springs, cams, valves, chain and belt drives, and other rapidly moving parts. It has been found useful for synchronization; for the determination of speed losses from friction or slip; and observing vibration and deflection.

New Machine for Making ¼ to ½-In. Bolt Size Nuts

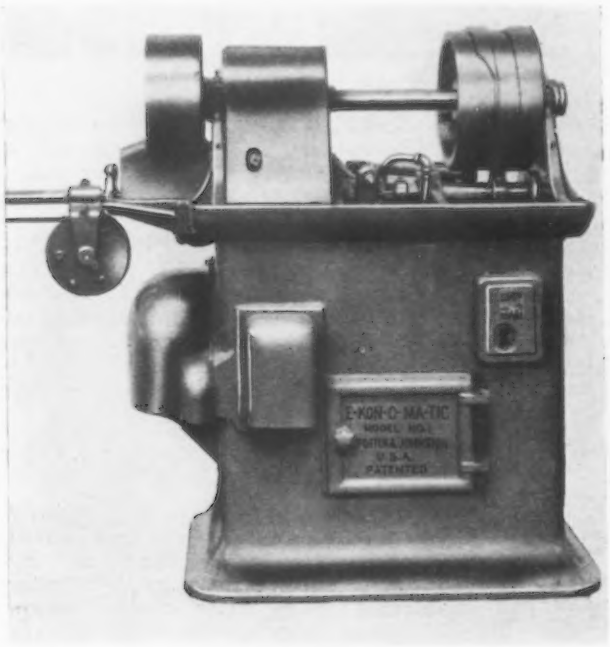
PLAIN or castellated nuts, U. S. or S.A.E. standard, ranging in bolt size from ¼ to ½ in., can be manufactured in the "Ekonomatic" nut machine recently brought out by the Potter & Johnston Machine Co., Pawtucket, R. I.

Simplicity and compactness, 2 x 3½ ft. overall base dimensions, are features. The main spindle will handle hexagon bars up to ⅞ in. across the flats for ½-in. hexagon nuts and 1-in. round stock. The 2-hp. driving motor installed in the base is said to supply ample power for all requirements. Use of a cut-off tool 1/16-in. in width and a stock-feeding mechanism which carries the bar completely through the spindle to the gripping surface of the collet is featured as holding wastage to a minimum.

The bar is fed into working position by means of a mechanism employing a long heavy coil spring contained within the feeding cable pulley. On the camshaft, directly over the spindle, there is a swing arm on which is mounted cams that engage and disengage the collet at the proper point in the operation cycle. The collet is of draw-back type, connected to the rear of the spindle by means of a tube on the end of which there is a collar. Pull-back of the collet is accomplished through fingers which are compressed by an external wedge collar. Operation of the center tool bar and swing arm that carries cut-off and forming tools is synchronized.

Only three cams are required, one for the feed and return of the center tool bar, one for the operation of the double-action swing arm, and the simple permanent cam for operating the collet. Changes of spindle speed are obtained by changing the motor sprocket; an adjustable idler is provided for compensating for variations in chain length. Within the base, and accessible through the main door is a strainer receptacle into which the finished parts pass as they are cut off. Below is the main supply of coolant, which is delivered to the spindle nose by means of a chain driven gear pump. The machine being of single-spindle type and without indexing mechanism, soluble oil coolants may be used without detriment to the operating parts.

The spindle is mounted on antifriction bearings and all gears are of steel and are heat treated. The net weight of the machine is 1900 lb.



The main spindle will handle hexagon bars ⅞-in. across the flats and round stock 1 in. in diameter. The 1/16-in. wide cut-off tool and the stock feed are featured as holding wastage to a minimum.

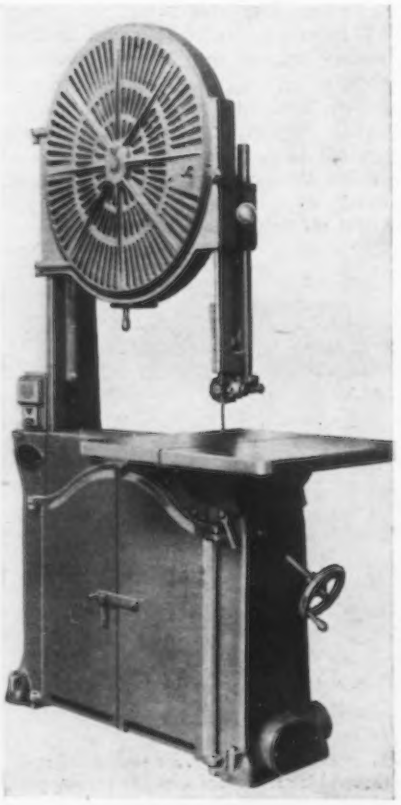
Electric Hoist Manufacturers' Association reports that the number of hoists ordered in October increased almost 1 per cent as compared with those ordered in September, but the value of the orders decreased nearly 11 per cent. Shipments were 6.7 per cent smaller in October than in September.

Bandsaws of Heavy and Compact Construction

COMPACTNESS and heavy construction, with minimum of vibration even at high speeds, are emphasized by the Yates-American Machine Co., Beloit, Wis., in announcing its new series of high-speed scroll bandsaws.

A modification intended to combine the advantages of both the straight and the "gooseneck" type of column supports the top wheel yoke assembly. Solid-disk aluminum wheels are supplied. A feature is the patented method of fastening the rubber bands to the wheel rims, making possible economical replacement of the bands in the department where the machine is used, without having to send wheels back to the factory for vulcanizing. The wheels and the saw blade are completely inclosed and guarded, except at the cutting point.

The company's standard resaw type knife-edge straining device keeps the saw at proper tension at all times. The machines are furnished in motor drive, direct motor drive or belt drive, with standard ball-bearing mounted motor applications, operating at speeds from 600 to 1200 r.p.m. Sawdust is removed efficiently through a built-in dust chute, irrespective of tilt of the table. The table, tilted by a handwheel and equipped with angle gage and self-locking device, can be tilted 45 deg. to the right and 10 deg. to the left. The main table of the Y-36 machine measures 36 x 36 in., and that of the Y-30 saw is 28 x 30 in. The larger machine will take stock 35½ in. wide and 21 in. thick, while the Y-30, the smaller, is for stock up to 29½ in. wide and 18 in. thick.



Large Shipments of Semi-Finished Steel in October

WASHINGTON, Nov. 27.—Exports of skelp in October, amounting to 20,061 gross tons, reflected the largest outgoing movement of iron and steel products in that month, which, as stated in THE IRON AGE of Nov. 27, totaled 131,850 tons, an increase of 639 tons over September. Shipments of skelp abroad in October exceeded by 7102 tons those of the preceding month and semi-finished steel as a whole, 22,277 tons, made the highest total since last March.

Exports of black steel sheets rose to 15,494 tons from 10,339 tons. Scrap exports increased to 12,156 tons from 7663 tons, but were otherwise the smallest since February, 1927. Exports of tin plate declined to 14,029 tons from 22,136 tons.

Exports in October of last year were 247,669 tons. In the first 10 months of 1930 they aggregated 1,771,069 tons, compared with 2,590,030 tons in the same period of last year. The drop was general—finished steel declined 618,000 tons; semi-finished, 33,000 tons; scrap, 113,000 tons; castings and forgings, 26,000 tons; pig iron, 31,000 tons.

Of the October imports, totaling 38,344 tons, a drop of 1941 tons from September, 13,552 tons was pig iron. India supplied 9256 tons and the United Kingdom 3407 tons of the latter product. The heaviest finished steel item of importation in October was structural shapes, 4881 tons.

In October of last year imports were 63,824 tons. In the first 10 months of the current year they were 434,538 tons, against 650,406 tons in the like period of last year.

Finished steel imports in October were the lowest since February, 1925.

Exports of Iron and Steel from the United States
(In Gross Tons)

	October		10 Months Ended October	
	1930	1929	1930	1929
Pig iron	1,419	1,432	12,641	44,061
Ferromanganese	....	33	6,803	1,388
Scrap	12,156	47,921	331,602	445,017
Pig iron, ferroalloys and scrap	*13,575*	*49,386*	*351,046*	*490,466*
Ingots, blooms, billets, sheet bar	579	1,733	15,547	40,064
Skelp	20,061	16,971	105,811	111,840
Wire rods	1,637	2,578	34,221	36,677
Semi-finished steel	*22,277*	*21,282*	*155,579*	*188,581*
Steel bars	5,263	13,077	74,806	165,686
Alloy steel bars	286	832	5,984	13,622
Iron bars	92	225	1,604	4,456
Plates, iron and steel	4,954	11,929	87,201	165,692
Sheets, galvanized steel	6,123	9,390	76,153	131,731
Sheets, galvanized iron	473		5,612	
Sheets, black steel	15,494	12,331	107,132	153,885
Sheets, black iron	908	1,363	9,879	13,313
Hoops, bands, strip steel	1,916	4,026	35,366	61,023
Tin plate; terne plate	14,029	23,389	203,426	217,662
Structural shapes, plain material	10,801	30,513	124,321	248,207
Structural material, fabricated	8,125	7,534	90,582	95,279
Tanks, steel	1,759	....	15,419	....
Steel rails	1,546	8,297	89,416	123,684
Rail fastenings, switches, frogs, etc.	1,032	2,531	16,872	27,234
Boiler tubes	837	1,630	13,025	16,114
Casing and oil-line pipe	3,295	8,668	55,407	102,336
Pipe, black and galvanized, welded steel	4,390	12,616	70,951	120,461
Pipe, black and galvanized, welded iron	703		13,302	
Plain wire	2,227	3,471	22,806	39,516
Barbed wire and woven wire fencing	2,901	5,673	34,778	56,605
Wire cloth and screening	73	115	1,435	1,446
Wire rope	266	597	4,039	6,267
Wire nails	733	721	7,079	10,901
Other nails and tacks	447	577	5,146	9,345
Horseshoes	24	89	160	376
Bolts, nuts, rivets and washers, except track	645	1,267	8,908	13,698
Rolled and finished steel	*89,342*	*160,861*	*1,180,809*	*1,798,539*
Cast iron pipe and fittings	2,248	9,019	27,742	38,563
Malleable iron screwed fittings	669	1,456	9,212	10,499
Car wheels and axles	1,445	2,210	13,155	18,676
Iron castings	228	528	5,633	9,532
Steel castings	498	871	8,601	9,675
Forgings	520	977	7,326	10,676
Castings and forgings	*5,608*	*15,061*	*71,669*	*97,621*
All other	1,048	1,079	11,966	14,823
Total	131,850	247,669	1,771,069	2,590,030

Imports of Iron and Steel Products into the United States
(In Gross Tons)

	October		10 Months Ended October	
	1930	1929	1930	1929
Pig iron	13,552	14,295	103,949	117,889
Sponge iron	10			
Ferromanganese and spiegeleisen*	2,247	6,634	42,417	67,490
Ferrochrome†	....	55	162	577
Ferrosilicon‡	74	1,115	3,964	8,421
Other ferroalloys	25	....	310	....
Scrap	4,336	11,062	23,809	81,868
Pig iron, ferroalloys and scrap	*20,244*	*33,161*	*174,611*	*276,245*
Steel ingots, blooms, billets, etc	2,264	2,944	17,561	23,845
Wire rods	496	642	7,395	13,250
Semi-finished steel	*2,760*	*3,586*	*24,956*	*37,095*
Concrete reinforcement bars	541	3,017	35,100	31,970
Hollow bar and drill steel	139			
Merchant steel bars	1,713			
Iron bars	109	110	977	2,556
Iron slabs	....			
Boiler and other plate	....	77	1,792	3,110
Sheets, skelp and saw plate	2,083	1,917	22,009	21,026
Tin plate	23	20	220	257
Structural shapes	4,881	9,378	105,236	128,018
Sheet piling	....			
Rails and rail fastenings	391	164	7,605	6,066
Welded pipe	252	3,150	17,286	33,734
Other pipe	822			
Barbed wire	428	450	3,885	4,936
Round iron and steel wire	158	400	3,797	5,029
Telegraph and telephone wire	11	5	60	19
Flat wire and strip steel	47	187	999	1,850
Wire rope and strand	196	281	2,086	2,060
Other wire	32	3	323	405
Hoops and bands	2,444	3,732	18,787	38,069
Nails, tacks and staples	578	609	4,560	8,003
Bolts, nuts and rivets	13	34	302	308
Horse and mule shoes	5	....	15	25
Rolled and finished steel	*14,866*	*23,534*	*225,039*	*287,441*
Cast iron pipe and fittings	364	3,427	8,657	47,959
Castings and forgings	110	116	1,275	1,666
Total	38,344	63,824	434,538	650,406
Manganese ore*	18,538	24,867	242,209	285,036
Iron ore	186,396	270,279	2,524,205	2,584,403
Magnesite (dead burned)	622	2,047	34,696	33,962

*Manganese content only.
†Chromium content only.
‡Silicon content only.

November Iron Output Down 10.9 Per Cent—Net Loss 4 Stacks

STILL another sharp decline in pig iron production took place in November, and the volume is down to the lowest rate in over six years.

Actual returns by wire on Dec. 2 from every active blast furnace operating during November show that the daily rate last month at 62,237 gross tons was about 11 per cent under that for October. There was a net loss of four active furnaces against eight in October.

Production of coke pig iron in November was 1,867,107 tons or 62,237 tons per day for the 30 days. This contrasts with 2,164,768 tons or 69,831 tons per day for the 31 days in October. The loss in daily rate was 7594 tons or 10.9 per cent. In October the loss was 8 per cent with 6.8 per cent in September, 4.3 per cent in August and 13 per cent in July.

The daily rate of 62,237 tons in November is the smallest since August, 1924, when it was 60,875 tons per day. The most recent smaller daily rate for November was the 47,183 tons for that month in 1921.

Total output for the first 11 months of this year has been 29,733,415 tons which compares with 42,448,853 tons for the same period in 1929. To Dec. 1, 1928, the total was 34,467,958 tons. The decline this year from 1929 is about 30 per cent.

Net Loss of 4 Furnaces

Eight furnaces were blown out or banked during November and 4 were blown in—a net loss of 4 for the month. In October the net loss was 8 stacks with 16 in September, 5 in August, 16 in July and 20 in June. In the eight months since March the net loss in furnaces has been 76.

Operating Rate on Dec. 1

For the 107 furnaces active on Dec. 1, the estimated operating rate is 60,-

Daily Average Production of Coke Pig Iron in the United States by Months Since Jan. 1, 1926—Gross Tons

	1926	1927	1928	1929	1930
Jan.	106,974	100,123	92,573	111,044	91,209
Feb.	104,408	105,024	100,004	114,507	101,390
Mar.	111,032	112,366	103,215	119,822	104,715
Apr.	115,004	114,074	106,183	122,087	106,062
May	112,304	109,385	105,931	125,745	104,283
June	107,844	102,988	102,733	123,908	97,804
½ year	109,660	107,351	101,763	119,564	100,891
July	103,978	95,199	99,091	122,100	85,146
Aug.	103,241	95,073	101,180	121,151	81,417
Sept.	104,543	92,498	102,077	116,585	75,890
Oct.	107,553	89,810	108,832	115,745	69,831
Nov.	107,890	88,279	110,084	106,047	62,237
Dec.	99,712	86,960	108,705	91,513	.....
Year	107,043	99,266	103,382	115,851	.....

Pig Iron Production by Districts, Gross Tons

	Nov. (30 days)	Oct. (31 days)	Sept. (30 days)	Aug. (31 days)
New York and Mass.	118,947	128,710	132,873	157,034
Lehigh Valley	52,344	72,938	66,448	70,491
Schuylkill Valley	25,790	25,340	25,664	29,501
Lower Susq. and Lebanon Valley	16,570	18,012	19,427	18,579
Pittsburgh district	425,446	530,689	554,662	581,528
Shenango Valley	50,909	54,750	64,584	68,735
Western Pennsylvania	50,856	53,952	60,241	65,850
Maryland, Va. and Ky.	69,728	83,621	91,066	98,214
Wheeling district	106,782	128,486	132,627	145,330
Mahoning Valley	118,572	157,775	186,436	224,891
Central and North'n Ohio	172,729	198,479	200,266	227,826
Southern Ohio	26,807	33,251	42,658	43,851
Illinois and Indiana	395,814	424,329	427,819	486,334
Mich., Minn., Mo., Wis., Colo. and Utah	93,627	106,683	110,202	114,057
Alabama	142,186	147,753	161,797	191,700
Tennessee	.....	.....	.....	.....
Total	1,867,107	2,164,768	2,276,770	2,523,921

Daily Rate of Pig Iron Production by Months—Gross Tons

	Steel Works Iron	Merchant Iron*	Total
November, 1929	83,276	22,771	106,047
December	68,152	23,361	91,513
January, 1930	71,447	19,762	91,209
February	81,580	19,810	101,390
March	83,900	20,815	104,715
April	85,489	20,573	106,062
May	84,310	19,973	104,283
June	77,883	19,921	97,804
July	66,949	18,197	85,146
August	64,857	16,560	81,417
September	62,342	13,548	75,890
October	57,788	12,043	69,831
November	49,730	12,507	62,237

*Includes pig iron made for the market by steel companies.

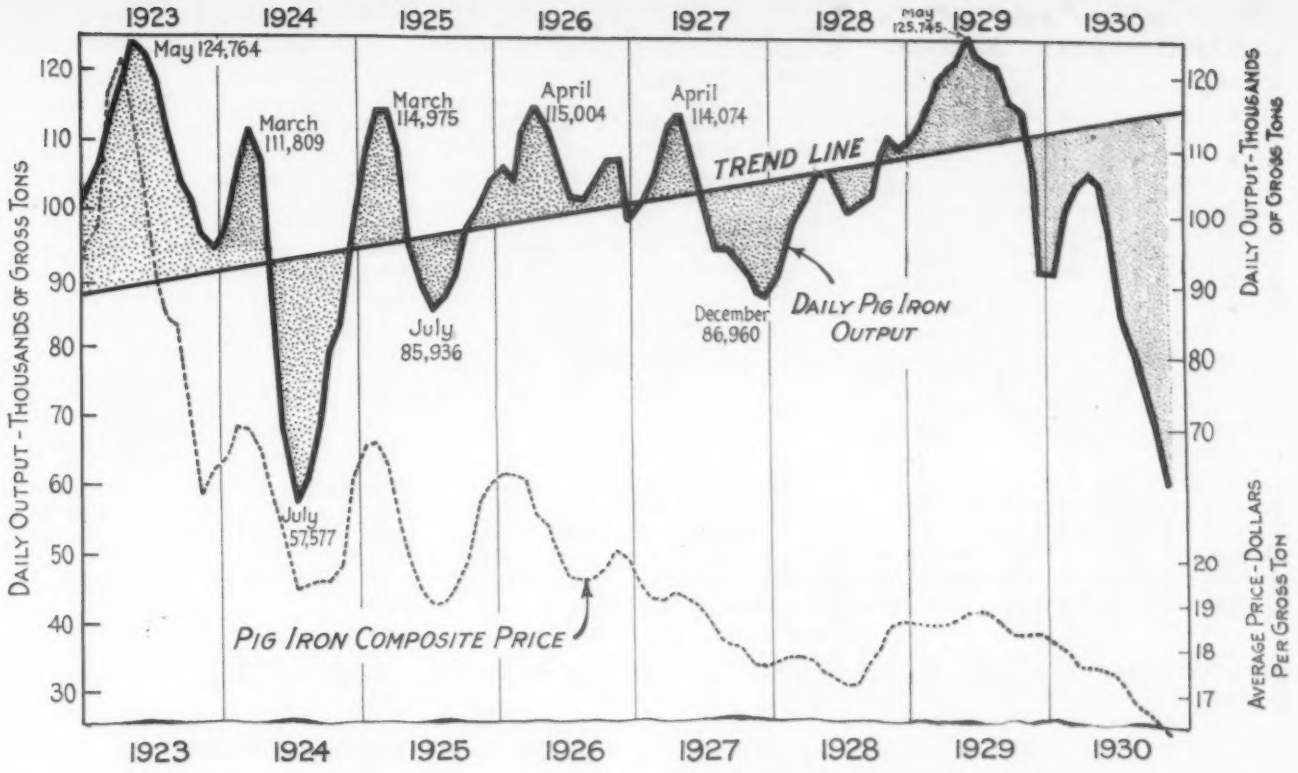
Coke Furnaces in Blast

Furnaces	Dec. 1 Number in Blast	Dec. 1 Rate of Operation	Nov. 1 Number in Blast	Nov. 1 Rate of Operation
New York:				
Buffalo	5	3,375	5	3,295
Other N. Y. and Mass.	2	590	2	710
New Jersey	0	....	0	....
Pennsylvania:				
Lehigh Valley	4	1,245	5	2,350
Schuylkill Valley	2	860	2	815
Susquehanna Valley	1	550	1	580
Ferromanganese	0	....	0	....
Lebanon Valley	0	....	0	....
Ferromanganese	0	....	0	....
Pittsburgh District	21	13,000	23	15,480
Ferromanganese	2	310	2	310
Shenango Valley	3	1,700	2	1,300
Western Pennsylvania	2	1,050	2	1,260
Ferromanganese	1	215	2	400
Maryland	2	1,505	3	2,305
Wheeling District	5	3,560	5	3,565
Ohio:				
Mahoning Valley	6	4,300	7	4,935
Central and Northern	9	5,310	10	5,980
Southern	3	890	3	840
Illinois and Indiana	19	13,190	19	13,900
Mich., Wis. and Minn.	4	1,945	4	2,110
Colo., Mo. and Utah	4	1,575	2	875
Ferromanganese	0	....	1	80
The South:				
Virginia	1	200	1	245
Ferromanganese	1	95	0	....
Kentucky	0	....	0	....
Alabama	10	4,740	10	4,630
Ferromanganese	0	....	0	....
Tennessee	0	....	0	....
Total	107	60,205	111	65,965

Production of Coke Pig Iron in United States by Months Beginning Jan. 1, 1928—Gross Tons

	1928	1929	1930
Jan.	2,869,761	3,444,370	2,827,464
Feb.	2,900,126	3,206,185	2,838,920
Mar.	3,199,674	3,714,473	3,246,171
Apr.	3,185,504	3,662,625	3,181,868
May	3,283,856	3,898,082	3,232,760
June	3,082,000	3,717,225	2,934,129
½ year	18,520,921	21,640,960	18,261,312
July	3,071,824	3,785,120	2,639,537
Aug.	3,136,570	3,755,680	2,523,921
Sept.	3,062,314	3,497,564	2,276,770
Oct.	3,373,806	3,588,118	2,164,768
Nov.	3,302,523	3,181,411	1,867,107
11 months	34,467,958	39,448,853	29,733,415
Dec.	3,369,846	2,836,916	.....
Year*	37,837,804	42,285,769	.....

*These totals do not include charcoal pig iron. The 1929 production of this iron was 138,193 gross tons.



Daily production of pig iron is now proportionally about as much below needs as in 1924

Inclined line represents the gradually increasing theoretical needs of the country, ascertained by a balancing of the ups and downs in production. It shows an average yearly increase in consumption of about 1,275,000 *tons*

205 tons per day which contrasts with 65,965 tons per day for the 111 furnaces active on Nov. 1.

Of the 8 furnaces shut down last month, 7 were independent steel company stacks with one credited to the Steel Corporation. One independent steel company furnace and 3 merchant stacks were blown in. The net loss in steel-making furnaces was 7.

Possibly Active Furnaces Reduced

With the dismantling of the two Low Moor furnaces in Virginia, the number of possibly active stacks in the United States is reduced from 314 to 312.

Furnace Changes in November

Four furnaces were blown in during November as follows: The Neville Island furnace of the Davison Coke & Iron Co. in the Pittsburgh district; the Oriskany furnace of E. J. Lavino & Co. in Virginia (blown in late in October but not reported); the Shenango furnace in the Shenango Valley; and one furnace of the Colorado Fuel & Iron Co. in Colorado.

The following furnaces were blown out or banked during November: "A" furnace at the Bethlehem plant of the Bethlehem Steel Corpn. in the Lehigh Valley; one Aliquippa and one Eliza furnace of the Jones & Laughlin Steel Corpn., and one Monessen furnace of the Pittsburgh Steel Co. in the Pittsburgh district; "L" furnace at the Cambria plant of the Bethlehem Steel Corpn. in western Pennsylvania; "A" furnace at the Sparrows Point plant of the Bethlehem Steel Corpn. in Maryland; one Haselton furnace of the Republic Steel Corpn. in the Mahoning Valley and No. 2 furnace of the National Tube Co. in Ohio.

Production of Steel Companies for Own Use—Gross Tons

	Total Pig Iron Spiegel and Ferromanganese			Ferromanganese*		
	1928	1929	1930	1928	1929	1930
Jan.	2,155,133	2,651,416	2,214,875	22,298	28,208	27,260
Feb.	2,274,880	2,498,901	2,284,234	19,320	25,978	21,310
Mar.	2,588,158	2,959,295	2,600,980	27,912	24,978	23,345
Apr.	2,555,500	2,826,028	2,564,681	18,405	22,413	27,777
May	2,652,872	3,105,404	2,613,628	29,940	25,896	30,296
June	2,448,905	2,999,798	2,304,223	32,088	33,363	27,327
½ year	14,675,448	17,040,842	14,582,621	149,963	160,836	157,325
July	2,464,896	3,039,370	2,075,414	32,909	31,040	17,728
Aug.	2,561,904	3,065,874	2,010,572	24,583	28,461	20,909
Sept.	2,477,695	2,862,799	1,870,269	22,278	27,505	21,181
Oct.	2,729,589	2,902,960	1,791,421	23,939	31,108	24,480
Nov.	2,654,211	2,498,291	1,491,927	29,773	31,866	18,619
11 months	27,563,743	31,410,136	23,832,224	283,445	310,816	260,242
Dec.	2,647,863	2,112,704	.....	28,618	28,564	.....
Year	30,211,606	33,522,840	.....	312,063	339,380	.....

*Includes output of merchant furnaces.

American Metal Products Co., Thirty-fourth and Burnham Streets, Milwaukee, Wis., manufacturer of acid-resisting castings, bearing metal, etc., under the trade mark name "Ampco," has changed its name to Ampco Metal, Inc. The capital stock of the company has been increased from $400,000 to $500,000. Ultimately the company will increase its capital to $1,000,000. The additional funds will be used for a plant extension.

National Steel Corpn. declared the regular quarterly dividend of 50c. a share, payable Dec. 10 to stock of record Nov. 30. National Steel is one of the few steel companies which earned its dividend in the third quarter with a liberal margin.

Gray Iron Foundries at 65.6 Per Cent in October

Production by gray iron foundries during October was maintained at about the same rate as during September, according to the monthly report of the Gray Iron Institute. September is the first month in six in which the percentage of production increased over that of the preceding month. Operations during October were 65.6 per cent of normal, compared with 65.7 per cent in September, as indicated by reports from 161 foundries. New business was 47.4 per cent of normal, compared with 49 per cent in September, as was shown by 81 reports.

Best operations during October, 71 per cent of normal, were in Wisconsin, Illinois and the territory west of the Mississippi River. This compares with 69.6 per cent in September. The Chicago district increased from 68.2 per cent to 80.3 per cent. There was a decline of 2 per cent to 63.3 per cent in production by foundries in Pennsylvania, Michigan, Ohio, Indiana and the South (east of the Mississippi River). Operations of foundries in New England, New York and New Jersey and Canada were 63.1 per cent, compared with 61.4 per cent during the previous month.

Greatest activity was shown in foundries having a normal production of 250 to 400 tons. These operated in October at 70.2 per cent of normal, compared with 66.1 per cent in September. Two foundries reported that the business outlook is good, 46 fair, 70 poor and 15 bad.

Orders were placed in September for 1254 steel boilers with 1,282,388 sq. ft., against 1371 with 1,356,751 sq. ft. in August, according to reports received by the Department of Commerce from 81 producers.

Steel Castings Orders and Output Decline

WASHINGTON, Dec. 2.—Orders for commercial steel castings in October totaled 45,546 net tons, or 32 per cent of capacity, against 49,542 tons, or 34 per cent of capacity, in September, according to reports received by the Bureau of the Census from the principal manufacturers. Production in October was 59,506 tons, or 41 per cent of capacity, compared with 61,919 tons, or 43 per cent of capacity, the preceding month.

Otis Steel Omits Common Stock Dividend

The Otis Steel Co., Cleveland, has declared its regular quarterly dividend of $1.75 per share on prior preferred stock, but omitted the dividend on common stock, on which it has been paying 62½c. per share quarterly.

Machinery Exports Go Lower But Imports Rise

WASHINGTON, Dec. 1.—Exports of machinery in October were valued at $30,973,621, against $33,828,756 in September. In the first 10 months they were valued at $450,990,883, compared with $510,458,942 in the corresponding period of last year.

Machinery and vehicles to the value of $47,347,298 were exported in October, comparing with $52,283,939 in September. In the first 10 months of 1930 similar exports were valued at $729,925,251, against $1,041,010,469 in the first 10 months of 1929.

Industrial machinery, as classified by the Division of Statistics, Department of Commerce, to the value of $14,045,801 was exported in October. October exports of power-driven metal-working machine tools totaled 424 in number, valued at $743,126, against 532, valued at $939,071, in September.

Imports of machinery, as listed in THE IRON AGE table, were valued at $1,837,278 in October, against $1,252,860 in September. In the first 10 months of 1930 they were valued at $21,563,473, against $27,421,980 in the like period of last year.

Machinery Exports from the United States
(By Value in Thousands of Dollars)

	October		10 Months Ended October	
	1930	1929	1930	1929
Locomotives	$48	$132	$643	$3,165
Other steam engines	13	64	421	656
Boilers	74	287	1,191	1,753
Accessories and parts	19	116	743	827
Automobile engines	106	368	5,431	9,830
Other internal combustion engines	421	821	7,195	8,545
Accessories and parts	219	313	2,990	3,691
Electric locomotives	88	99	879	608
Other electric machinery and apparatus	708	1,208	8,761	11,236
Excavating machinery	557	491	8,408	6,825
Concrete mixers	42	96	765	1,250
Road-making machinery	147	158	2,973	2,847
Elevators and elevator machinery	215	523	4,330	4,592
Mining and quarrying machinery	738	1,767	13,043	15,239
Oil-well machinery	951	2,493	21,761	21,482
Pumps	548	927	7,880	9,725
Bending and power presses	319	190	3,651	2,800
Forging machinery	58	120	1,699	1,235
Machine tools	1,443	2,408	21,313	23,825
Other metal-working machinery and parts	450	620	5,664	6,316
Textile machinery	761	1,108	7,530	11,024
Sewing machines	506	970	6,056	8,889
Shoe machinery	123	109	1,460	1,612
Flour-mill and gristmill machinery	71	46	415	547
Sugar-mill machinery	406	689	3,798	3,883
Paper and pulp-mill machinery	314	323	2,983	3,264
Sawmill machinery	33	63	618	74
Other woodworking machinery	143	206	1,557	1,991
Refrigerating and ice-making machinery	264	1,261	2,864	13,523
Air compressors	312	705	4,985	6,571
Typewriters	1,225	1,839	14,461	19,723
Power laundry machinery	78	195	1,189	1,701
Typesetting machines	1,225	344	14,460	4,892
Printing presses	298	454	4,483	5,617
Agricultural machinery and implements	3,417	10,451	100,693	120,176
All other machinery and parts	14,634	21,139	163,698	170,525
Total	$30,974	$53,103	$450,991	$510,459

Imports of Machinery into the United States
(By Value)

	October		10 Months Ended October	
	1930	1929	1930	1929
Metal-working machine tools	$42,978	$300,269	$843,166	$1,204,679
Agricultural machinery and implements	338,463	467,338	8,208,960	7,927,726
Electrical machinery and apparatus	312,814	216,803	2,321,276	2,348,070
Other power-generating machinery	46,992	46,225	502,814	1,003,286
Other machinery	963,719	1,209,865	7,543,584	10,269,537
Vehicles, except agricultural	132,312	407,955	2,143,673	4,668,682
Total	$1,837,278	$2,648,455	$21,563,473	$27,421,980

Output Curve Still Above Demand

BY LEWIS H. HANEY

DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

OCTOBER decrease in indicated steel requirements was due to declines in automobile production, building activity, general manufacturing and machine tool orders and exports. Only mining activity (chiefly coal) increased. Railroad freight traffic, considering the season, held about level. The net result was the sharpest drop in the composite demand line since last June. The present situation is clearly not like that found in the middle of 1921 or 1924. In those cases, the steel production curve was below the demand level, and was rising. Now production is above the indicated demand and is still declining.

A turn *might* come by January, but it seems difficult to anticipate one in 30 days. It may be that shortages are in the making in other industries, but our measurements do not indicate that this is the case in the steel industry.

In Certain Industries

Among *railroads*, we find car loadings the lowest for the season in several years and declining more than usual. Railroad gross revenues in October were about 18 per cent below last year, while net operating income was about 25 per cent lower. The surplus of equipment is large. Buying of rails is considerably less than seasonal. Unfilled orders for locomotives are the lowest on record, in spite of declining shipments. The most encouraging feature is the fair buying of freight cars. Perhaps under stimulus of special financial arrangements, freight car orders in October increased more than seasonally and, except for 1929, were the largest for the month since 1925, while current reports indicate continued good orders.

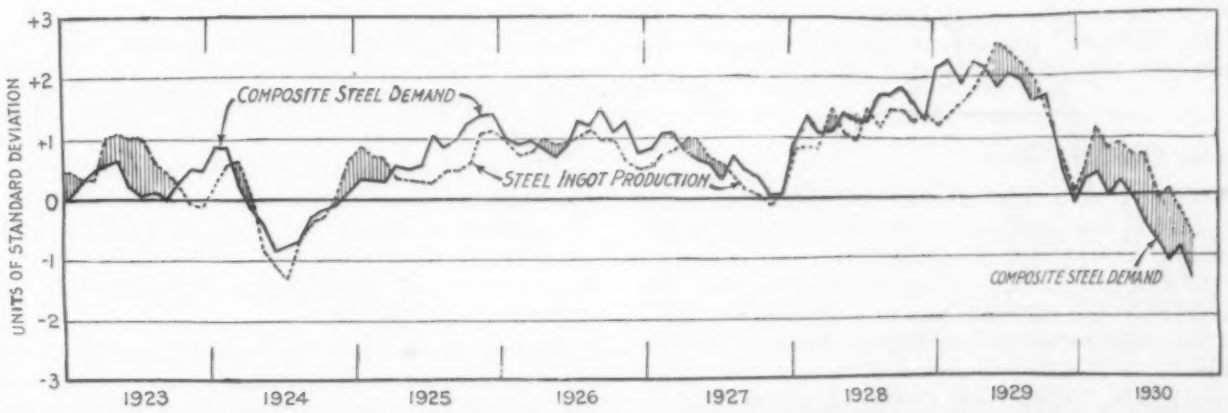
Residential *building* has been doing somewhat better in certain sections, but construction as a whole made a disappointing showing in October, contracts awarded (floor space) reaching a new low. It is increasingly apparent that there has been much overbuilding of commercial and industrial structures, and that it will take time for the demand to catch up. The bond market continues backward. Building as a whole is probably scraping bottom, but hopes for a sustained recovery must await developments next spring.

No one expects a general expansion in the *automobile industry* before early 1931. Meanwhile, the production of new models for dealers' stocks is of limited proportions. It is difficult to see anything but a moderate recovery in sales next year—in the first half, at least. More automobiles are not one of the necessary requirements of the people during the next few months.

No basis is apparent for anticipating a recovery in *general manufacturing* (excluding steel and automobiles) before next spring, either in domestic or in foreign demand. New lows reached in factory employment and payrolls tell the story currently. One can hardly expect much as long as the two keys of our post-war prosperity—automobiles and building activity—continue so backward.

In the *mining and oil industries* we see curtailment through production agreements and price reductions. Nowhere are there shortages which indicate the likelihood of a sustained expansion in operations. *Farm* purchasing power is much reduced. The prices of the chief crops are maintained with difficulty, even at present low levels, by the aid of large Government subsidies, and exports are low. Accordingly, the farm implement business shows reduction, with employment therein during the past three months the lowest since March, 1925. The situation is made worse by strained credit conditions in many rural sections.

Exports of iron and steel showed a less-than-seasonal gain in October, and continue to reflect depressed conditions abroad.



Until production falls below demand little hope for improvement can be held out. Present indications call for an up-movement in the spring.

W. W. MACON
Editor

THE IRON AGE

A. I. FINDLEY
Editor Emeritus

(ESTABLISHED 1855)

Looking for Lower Retail Prices

ECONOMISTS and other observers of price trends derive some encouragement from the fact that the downward movement of wholesale commodity prices has apparently been halted and may, in fact, soon turn upward, although other business indexes are still pointing downward.

A business recovery usually makes its start from a low level of prices and is accelerated by a rising trend of prices. There is commonly a lag between the marking down of wholesale prices and declines in retail prices. As business improvement depends to a considerable extent on the volume of retail trade, there is now frequent comment that a buying movement of goods sold over the retail counters might be brought about if retailers were to pass along to their customers the reductions that have occurred in wholesale prices.

The Irving Trust Co. of New York, in its review of business, states that "it would seem inevitable that retail prices must recede considerably in order to be in line with the new environment."

Retail sales are being stimulated by an almost unprecedented volume of daily newspaper advertising, by "buy now" propaganda in various cities and by the familiar device of putting out "bargains." The impression widely prevails, however, that, except for some food products, retail prices are not materially lower on most of the necessities.

Aided by seasonal demands and the Christmas trade, retail business is commonly at its peak in October, November and December. Department store sales in October in 521 institutions dropped only 8 per cent from those of the same month last year, while the decline for 10 months was only 7 per cent. In the face of such a moderate falling off in their trade, it is, perhaps, natural that the large retailers are slow to respond to the lower price level in commodity markets. Not before January probably will retail prices show the expected adjustment.

Water Over the Dam

CLASS I railroads of the United States made capital expenditures of $698,821,000 during the first nine months of this year, which was the largest for the first nine months of any year since 1923. We congratulate the railroads on their courage and hope that they will secure proper returns from the investments.

During the nine months of this year their freight car loadings decreased 12.1 per cent from 1929 and 10.4 per cent from the four-year average. During eight months of the year their ton-mileage decreased 12.3 per cent from last year, their operating revenues 14.2 per cent, operating expenses 10.0 per cent, operating revenue 25.1 per cent and operating income 29.8 per cent, while the rate of return on book property investment decreased from 5.48 per cent to 3.59 per cent.

There has also been more or less detailed information lately about public expenditures on road building and other activities, provided for by current taxes or by borrowing against future taxes. The utilities have made large expenditures, also. Comprehensive statistics have not been assembed of expenditures by the steel industry, but it is well known that they have been large.

A year ago the popular impression was that one big thing had occurred, and only one thing, a collapse of the stock market. One would suppose that would impair credit and make it difficult to secure money for capital expenditures, yet these large expenditures have occurred. Four months before the stock market collapsed the volume of trade had begun to recede and the recession, with perhaps a slight ascent early this year, has continued practically to date.

Capital expenditures, with expansion of facilities, are called for when trade activity is expanding with the general growth of the country. They are not called for in special volume during a temporary and special bulge in activity, which would be too short lived to employ the additional facilities. They are not called for on the eve of a general trade depression or in its early period if it is to be a prolonged one, while they are likely to be in keeping in the latter part of a depression to take advantage of low construction costs and to anticipate improvement in trade.

Planning and decisions as to capital expenditures take time and occur before the beginning of execution. Serious consideration should be given to the question how far recent spending has been related to, or predicated upon, the state of trade that existed up to a little more than a year ago, and how far it is in harmony with the trade conditions since witnessed.

The stock market collapse did not greatly curtail capital expenditures, as might well have been feared. The ability to finance has been left, but we do not know what henceforth will be the disposition respecting capital expenditures, now that the background is so different.

A year ago we had good news, through the President's conferences at Washington, as to prospective capital expenditures. Lately we have had good news as to the execution, but such news now represents water over the dam. We are still engaged in looking for recovery, the power for which will not come from such water. This will come from the people at large getting into better position through thrift

and a balancing of budgets, recovery working from the bottom upward. Some recovery will come from above, but we must bear in mind how much influence we have had from that already, by these capital expenditures.

Seasonal Variations in Employment

SIXTEEN pages of the November number of the Federal Reserve Bulletin, just issued, give results of an exhaustive study of factory employment, covering 22 industries beginning with 1919 and 29 additional beginning with 1923. In previous numbers factory employment was reported for a smaller number of industries, not adjusted for seasonal variation. A particular purpose of this new study was to develop factors of seasonal variation so that current news as to employment may be adjusted to bring out the underlying trend. The industries taken are all manufacturing, no mining being included. The study deals only with number of employees, variations in working time not being considered.

The seasonal character of steel making is well known, there being regularly a bulge in the first half of a year, usually culminating in March, and a smaller bulge, usually culminating, as to ingot production, in October. As to employment, however, the Board makes the later bulge culminate in September. Reasons for this variation have not been easy to find, and it is of particular interest therefore to learn that the Board finds after putting 51 industries together a somewhat similar swing in employment. The industries have different seasonal variations, one from another, but the variations do not compensate. The general average differs from steel, however, in having the second peak of the year higher than the first.

A graph for the combination of 51 industries is given, showing January as the low month, employment ranging up to March and April, declining to a low July and rising to a September peak, the high for the whole year. January is about 2 per cent below the average and September about 2 per cent above.

In some of the individual lines peaks for the whole year fall as follows: Steel works and rolling mills, March; hardware, February; structural iron work, August; steam fitting, September; cast iron pipe, July; foundry and machine shop products, also machine tools, also agricultural implements, March. In the case of hardware and stoves there was evidence of progressive change in seasonal movement from year to year and instead of giving the average for a number of years 1929 only is given, February being the high month for hardware and October for stoves.

The average number of employees in 1923-4-5 being taken as 100, it is found when adjustment is made for seasonal variation that steel works and rolling mills gave maximum employment, 109.2, in August, 1923, dropping to a low point, 85.7, for August, 1924. The subsequent high was for August, 1929, at 103.6, the subsequent minimum being for last September, 83.3, where the presentation stops.

While the new presentation is a matter of showing seasonal variation, not hitherto studied, a comparison of employment in selected lines between 1923 and 1929 is interesting, showing how in certain cases there were decreases in employment when there was a large increase in production:

Number in Employment
(1923-4-5 = 100)

	1923	1929
Steel works and rolling mills....	104.9	99.8
Structural iron work.....	104.6	117.0
Foundries and machine shops...	111.1	106.7
Electrical machinery	99.9	125.6
Agricultural implements	110.0	159.1
Automobiles	100.6	113.8
Stamped and enameled ware....	114.0	79.0

No Tariff Tinkering

AT no time have informed sources believed that the Hawley-Smoot tariff act would be revised during the Hoover administration. The vigorous statement of Senator Smoot, chairman of the Committee on Finance, that the question is not whether the tariff is too high but whether it is high enough, only confirms this view.

Coming on the heels of renewed attacks on the law the pronouncement of the Senator is interpreted as a defense of the act and not as an intimation of plans for general upward revision. It is absurd to think that the forthcoming short session of the present Congress would indulge in such an effort. At the outset the new law has not as yet been given a fair test and there is not the remotest reason to think President Hoover does not concur with this statement.

Nor is it conceivable that, even if he thought otherwise, he would alarm business, particularly in the existing critical period of depression, by asking tariff legislation almost immediately after the passage of a tariff act. To do so would be repudiation of the law with all the adverse business and political effects that would follow. Moreover, it would be unprecedented to enact general tariff legislation at a short session.

Further practical reasons are that the Administration forces do not have sufficient strength and will be gratified if necessary appropriation and other essential measures are enacted without the necessity of calling an extra session, which would bring in a new Congress, when the Administration apparently will not have a working majority in either branch.

Merely as political gestures, it may well be expected that anti-administration forces will present "pop-gun" bills to revise tariff duties, but assuming their passage in Congress they could not be enacted without Presidential sanction, since even the new Congress will not be able to muster the required two-thirds majority to override a Presidential veto.

So while coalition forces may seek to stage political plays through the tariff, there is not likely to be any real tariff tinkering during the present administration. The tariff changes that will be brought about in that period may come only through the flexible provision.

It can be only a surmise what the Tariff Commission and the President may do through this medium, because the Commission just recently began a long series of investigations under the new flexible provision and has had no time to reach conclusions as to any. Many of these investigations are based on Senate resolutions, some of which are generally viewed as having been introduced for political purposes. It is therefore likely they will result in few, if any, changes.

To Aid Unemployment Relief

Engineers Adopt Program to Assist Emergency Committee —Colonel Woods Addresses Annual Meeting

THE American Society of Mechanical Engineers in one of the opening sessions of its fifty-first annual meeting, being held in New York this week, adopted a resolution pledging cooperation and assistance in the work of President Hoover's Emergency Committee for Employment, which is headed by Col. Arthur Woods.

The society will undertake a program of (1) urging industry to adopt measures now to relieve the winter emergency, (2) compiling data as to effective policies and methods used to deal with the general question of irregular employment, and (3) assisting in all other practicable ways. The council of the society has authorized appointment of a committee to organize and direct the work. This action was taken as the result of a proposal by Colonel Woods to the American Engineering Council, which, through L. W. Wallace, executive secretary, requested the A.S.M.E. to sponsor a study of what industry has done to stabilize employment, both during the present crisis and the past.

Colonel Woods addressed a large gathering at a special session of the annual meeting, Dec. 1. President Harding's conference on unemployment in the midst of the depression of 1920-21 was, he pointed out, the first Federal recognition of unemployment as a national problem. The text of his address was the following observation of Herbert Hoover, who when Secretary of Commerce, at the conclusion of the deliberations of that conference said: "There is a solution somewhere and its working out will be the greatest blessing yet given to our economic system, both to the employer and the employee."

"I know of no group in our nation occupying a functional relation to modern industry that can contribute more to the practical solution of this grave problem than the engineer" said Colonel Woods.

Unemployment Problem in Human Relations

"Today we are face to face with an unemployment crisis which, in its extent and in its range, is one of the most discouraging since 1900. Furthermore, in previous crises, the United States has been able to look to a solvent Europe to find a market for our surplus goods. Today Europe itself is in the throes of a world-wide depression, with a great burden of war debts of one kind or another which makes it impossible for us to count on their markets as we have in the past. We must, in a word, look within our country rather than without for the solution of this great problem. We must find within the resources of every community throughout this country the basis for our recovered industrial prosperity.

It is my own belief that if the engineers of America could apply the same degree of trained intelligence to this problem of the stabilization of American industry that they have in the past to the expansion of American industry, we should march a very long way toward the regularization of employment. That, in a word, is the challenge of this emergency to the Engineers."

Plans worked out by several individual companies to deal with fluctuations in employment, "plans which stand as sort of a beacon light in our present emergency," were briefly outlined. It was emphasized, however, that the whole problem of unemployment can not be dealt with by the efforts of individual managements working at the task of regularization in their own concerns. "They can do much," said Colonel Woods "but the cure, like the cause, does not lie in them alone. We must realize that in times of severe economic stress many of them have all they can possibly do to keep themselves afloat.

"Further, we must be fundamental enough in our thinking to realize the necessity of trying to find out what caused the storm, what started this economic typhoon. Collectively we must seek the reasons. Our industrial system finds itself in a grave, stupid and anomalous situation. We have abundant resources of raw materials, man power, manufacturing, transportation and distribution facilities. We also have a seeming plethora of fluid capital. On the one hand we have idle workers—hundreds of thousands of them—able to work, exceedingly anxious to do so, and desperately in need of the things which they might produce if they had the opportunity; on the other, we have idle plants which the owners very much desire to have in operation, and in many cases desparately need to set working for financial reasons. Yet we do not know how to bring the two together. No one profits by the situation; everyone loses. It seems to be nobody's fault. It has come about as the result of uncontrolled economic forces which are not well understood.

"I submit that industrialists, economists, engineers and statesmen should now address themselves wholeheartedly to the correction of this stupid situation, with a fixed determination to stay on the job until it is finished."

Wickwire Spencer Expands Activities in Southwest

The Wickwire Spencer Sales Corpn., New York, which up to the present time has maintained a small office in Tulsa, Okla., selling oil field rope, has taken a long-term lease on a building to be erected in Archer Street, that city, and will maintain offices there in addition to a large warehouse stocked with wire rope, chain link fence, Clinton electric welded fabric, welding rods and other products of the company. The district covered by the Tulsa office includes Kansas, Oklahoma, Texas, New Mexico, Arkansas, Louisiana and Mississippi.

E. L. Stevens will have charge of sales. L. J. Baldwin will be in charge of sales of the American Wire Fabrics Corpn., a subsidiary. J. J. Lovell will be in charge of sales of Wickwire-Spencer wire rope. G. L. Crawford will be in charge of Clinton electric welded fabric.

Cleveland Aids Inventors

Inventors and inventions are having their day in Cleveland. Through a new service established by the Industrial Development Department of the Chamber of Commerce, inventors may submit descriptions of their devices. These are then listed in a letter which is sent to more than 2000 manufacturers.

The man with an idea only is also encouraged, although it is suggested that he protect himself if patents have not yet been applied for. Several hundred people have already taken advantage of the plan and a number are now negotiating with Cleveland manufacturers.

Regional Foundry Meeting for Birmingham

Announcement is made by the American Foundrymen's Association that the second regional meeting, sponsored by that association, will be held at Birmingham, Jan. 20 and 21, 1931, with the cooperation and assistance of the foundrymen of the district. The first regional meeting of this nature was held at Moline, Ill., on March 26, 1930, with the cooperation of the Quad City Foundrymen's Association. Foundries in the Birmingham district have no organized local group, but the success of the meeting is assured. It is planned that on the first day, Jan. 20, visits to many important foundries of the vicinity will be arranged. On the second day a program of papers and discussions will be provided covering gray iron, steel, malleable and nonferrous foundry subjects.

American Manganese Steel Co., Chicago Heights, Ill., has appointed Southern Tractor Supply Co., 406 Geer Building, Durham, N. C., exclusive representative for the sale of manganese steel crawler tractor links and sprockets in District of Columbia, North Carolina, South Carolina, eastern Tennessee, Virginia and West Virginia.

Pig Iron Production Off 10.9 Per Cent in November

NET Loss of 78 Blast Furnaces Since April 1—Steel Ingot Output Now at 39 Per Cent Rate—Advance Impending on Heavy Rolled Products.

NOVEMBER brought a further decline in pig iron production and, with another month of low operations discounted because of the season, the attention of the iron and steel industry is focused on expected improvement in January.

Following the recent move to stabilize prices of bars, shapes and plates at 1.60c., Pittsburgh, a leading steel producer is preparing to announce an advance of $1 a ton to apply on first quarter business. Motives for such action are to be found in mounting costs, vanishing earnings and a belief that a stronger market will bring out latent business. Similar increases in prices were made during periods of depressed production in 1927 and 1922.

Total pig iron output in November was 1,867,107 tons, compared with 2,164,768 tons in October, and the daily average was 62,237 tons against 69,831 tons, a decline of 7594 tons or 10.9 per cent. Eight blast furnaces were put out in November and four were lighted, a net loss of four. On Dec. 1 there were 107 stacks in blast, or 78 fewer than on April 1 at the beginning of the decline in furnace activity. An Alabama merchant stack and a Buffalo steel works unit are scheduled to go out this week, while an Ohio steel company blast furnace may soon be relighted.

CURRENT specifications for iron and steel are adversely affected by the approaching holiday and inventory period, and steel ingot production, increasingly irregular, is now estimated at 39 per cent, compared with 41 per cent a week ago.

Low prices of pig iron have brought out further purchases for the first quarter, with recent activity greatest in the Chicago district, where one contract for 20,000 tons and several of 4000 to 5000 tons were closed. Pig iron prices have undergone no further change except in the Philadelphia district, where the market is off another 50c. a ton.

Relatively little forward buying has thus far developed in finished steel, although increasing interest is being shown in first quarter contracts, notably by the automobile industry. Motor car output, owing to suspensions for inventory purposes by many plants in the latter half of December, will probably dip to a new low for the year, but with improvement expected in the new year mills are counting on a fair volume of automotive steel orders for January shipment.

RAILROAD buying, although showing signs of revival, continues to lag far behind the volume of a year ago. The Reading has placed 10 heavy locomotives with the Baldwin Locomotive Works and the Milwaukee has entered the market for 57 engines. The Lehigh Valley is inquiring for 100 gondola cars and the Illinois Central may ask for revised figures on 2200 cars. Further expansion of railroad shop operations is bringing out increased purchases of steel for repair purposes.

The New York Central has entered the market for 125,000 tons of rails, while the Chicago Great Western is inquiring for 5000 tons and the Kansas City Southern for 8000 tons. The Northern Pacific has bought 1100 tons of tie plates from the Pacific Coast Steel Corpn. Rail mill operations are slowly increasing at Pittsburgh and Chicago, with the Chicago rate now up to 30 per cent, compared with 25 per cent a week ago.

THE large amount of pending structural steel work has been augmented by fresh inquiries for 17,000 tons. Awards, at 21,000 tons, are the smallest since September. Public works and public utility programs are featured by inquiries for 7000 tons of gas pipe by the United Gas Improvement Co., Philadelphia, and 3336 tons of cast iron water pipe by the city of Los Angeles.

Current tin plate specifications are sufficient to support mill operations of 40 to 45 per cent of capacity, but contracting for 1931 is still rather restricted. Steel pipe shipments were curtailed in November, but a number of large line pipe orders are still unfilled and will keep some mills busy through this month and well into January. Merchant pipe shipments failed to show an autumn increase and will total 25 per cent less for the year than in 1929.

SCRAP markets are listless and show little change except in eastern Pennsylvania, where heavy melting grade is off 50c. a ton.

Demand for heating and domestic coke has been stimulated by cold weather, but specifications for metallurgical coke are unimproved and in some districts, in fact, have declined.

The copper market has a better tone. Custom smelters, who were selling electrolytic copper a week ago at 10.50c., Connecticut valley, have advanced their prices to 11.50c.

European steel prices are stronger, following the booking of substantial overseas orders, especially from China and Japan.

THE IRON AGE composite prices for pig iron and steel scrap have reached new lows for the year, the former declining 9c. to $16.02 and the latter 16c. to $11.42 a gross ton. Finished steel remains at 2.135c. a lb. for the eighth week.

PITTSBURGH

Price Stabilization May Extend to an Advance on Bars, Shapes and Plates

PITTSBURGH, Dec. 2.—The attention of the steel trade in this district is rather generally focused on the extent of the expected January upturn in business rather than on the current situation. As a result, sentiment in the industry is fairly good and the abnormally low rate of operations is receiving little emphasis.

Efforts to stabilize prices are being continued by the leading companies, and so much success has been met with in maintaining quotations on bars, plates and shapes at 1.60c., Pittsburgh, that talk of an advance is rather general. Makers of the heavy hot-rolled products have not extended the present 1.60c., Pittsburgh, quotation into the first quarter, but talk of a price advance has brought into the market a few large consumers, who have been able to cover their needs beyond the first of the year at prevailing price levels.

While light demand has permitted no tangible test of recently named sheet and strip prices, some first quarter contracts have been signed, and prices appear to be more stable than they were two or three weeks ago.

Steel ingot production in this and nearby districts continues to reflect curtailment, particularly among the smaller units The leading interest is maintaining production at close to 50 per cent, but the average among the smaller independents is well under 35 per cent, and the district as a whole is scarcely averaging 40 per cent. Finishing mill production is also continuing downward, but is held up to some extent by the increasing operations of the local rail mill, which is now running at a fair rate. Structural tonnage is also keeping up, but the average in sheets is not above 35 per cent, with strip no higher. Tin plate schedules range from 40 to 45 per cent, and bar production is at a low point.

Steel consumers as a whole are not yet showing much interest in their first quarter requirements. As a result, sellers are not pressing very hard for contracts. On a number of items on which no official price announcement has been made, producers are willing to book first quarter tonnage at current price levels.

The railroads and the building industry promise the most convincing January improvement, but shipments to the automobile industry will be considerably heavier next month, and a fairly good general demand from other sources is expected The 1931 rail requirements of the two leading Eastern roads have not yet been announced, but action is expected before the middle of the month. Inquiry for some car building steel is still before the trade.

An advance of $1 a ton on bars, shapes and plates for first quarter may be announced shortly.

* * *

Some first quarter contracts for sheets and strip steel at recently stabilized price level have been made.

* * *

Steel ingot output continues to reflect general curtailment, especially a m o n g smaller units of industry.

* * *

Orders from railroads and building industry, with some aid from automobile makers, expected to lead in expected January improvement.

The market on raw materials lacks buoyancy, and both pig iron and scrap are dull. Little first quarter inquiry for pig iron has come out in this district, but prices are holding satisfactorily on current small orders. Scrap prices are generally unchanged, and the downward trend in prices, which has continued for several weeks, apparently has been checked.

Semi-Finished Steel

Consumers are showing no interest in future contracting, and shipments against old orders are very light. In the absence of tests, quotations on billets, slabs and sheet bars are unchanged at $31, Pittsburgh. Occasional sales of forging billets are being made at $36, Pittsburgh. Makers of wire rods have not officially opened their books for the first quarter, but are expected to continue the present $36, Pittsburgh or Cleveland, price into that period.

Pig Iron

One or two inquiries for first quarter have appeared, but consumers generally are showing no interest in their future requirements, and sales of a hand-to-mouth character predominate. The Walworth Co., Greenburg, Pa., has placed a tonnage of foundry and malleable iron for delivery in the first quarter, and the Westinghouse Electric & Mfg. Co., East Pittsburgh, has not yet closed against its needs for the same period. The market on basic iron is particularly dull, and shipments to non-integrated steel companies have declined. Occasional sales of malleable and Bessemer are bringing $17.50, Valley furnace, and foundry iron is fairly well maintained at $17, Valley, and $17.50, Pittsburgh furnace. No recent test has been made on basic iron prices.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$17.00
Bessemer	17.50
Gray forge	16.50
No. 2 foundry	17.00
No. 3 foundry	16.50
Malleable	17.50
Low phos., copper free	$26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$17.50
No. 2 foundry	17.50
No. 3 foundry	17.00
Malleable	18.00
Bessemer	18.00

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Bars, Plates and Shapes

Reports of an advance of $1 a ton in the price of bars, plates and shapes continue, but leading sellers can verify no change from the recently established minimum of 1.60c., Pittsburgh. While this figure has not been generally extended on first quarter business, large buyers are reported to have been offered protection over that period in a few cases. The price seems to be well established, and even on plates and shapes companies which usually get concessions have been forced to pay the full price on their current requirements. Demand continues very light, with structural and barge building projects uppermost in current prospects.

While structural awards in the immediate Pittsburgh district have not been heavy in the last few weeks, fabricating shops in this locality are taking considerable business in other parts of the country, and the larger interests are maintaining a fair operating rate. The Midland Barge Co. has been awarded 10 barges by the United States Engineer at Rock Island, Ill., which will take 750 tons of plates. The Inland Waterways Corpn. is expected to make formal inquiry this month for the barges and tow boats recently authorized. The Baltimore & Ohio has not yet placed steel for the 1000 gondola cars which it will build in its own shops, and the New York Central is understood to have decided against the purchase of freight cars at this time. This road, however, will buy 50 locomotives. Bar and structural mill operations are holding at recent levels, with the former very low. Plate production has declined somewhat in line with lighter skelp requirements from the pipe mills.

Rail and Track Accessories

While the two largest Eastern roads have not announced their 1931 rail requirements, inquiry is expected

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Dec. 2, 1930	Nov. 25, 1930	Nov. 3, 1930	Dec. 3, 1929
No. 2 fdy., Philadelphia	*$17.76*	$18.26	$18.76	$21.26
No. 2, Valley furnace	17.00	17.00	17.00	18.50
No. 2 Southern, Cin'ti	14.69	14.69	15.19	17.69
No. 2, Birmingham	14.00	14.00	14.00	14.50
No. 2 foundry, Chicago*	17.50	17.50	17.50	20.00
Basic, del'd eastern Pa	17.75	17.75	17.75	19.75
Basic, Valley furnace	17.00	17.00	17.00	18.50
Valley Bessemer, del'd P'gh	19.26	19.26	19.26	20.76
Malleable, Chicago*	17.50	17.50	17.50	20.00
Malleable, Valley	17.50	17.50	17.50	19.00
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	94.00	94.00	94.00	100.00
Rails, Billets, etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	31.00	31.00	31.00	35.00
Sheet bars, Pittsburgh	31.00	31.00	31.00	35.00
Slabs, Pittsburgh	31.00	31.00	31.00	35.00
Forging billets, Pittsburgh	36.00	36.00	36.00	40.00
Wire rods, Pittsburgh	36.00	36.00	36.00	40.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb	1.60	1.60	1.60	1.85
Finished Steel, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.60	1.60	1.60	1.90
Bars, Chicago	1.70	1.70	1.70	2.00
Bars, Cleveland	1.65	1.65	1.65	1.90
Bars, New York	1.93	1.93	1.93	2.24
Tank plates, Pittsburgh	1.60	1.60	1.60	1.90
Tank plates, Chicago	1.70	1.70	1.70	2.00
Tank plates, New York	1.88	1.88	1.88	2.17½
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.90
Structural shapes, Chicago	1.70	1.70	1.70	2.00
Structural shapes, New York	1.85½	1.85½	1.85½	2.09½
Cold-finished bars, Pittsburgh	2.00	2.00	2.00	2.30
Hot-rolled strips, Pittsburgh	1.55	1.55	1.60	1.90
Cold-rolled strips, Pittsburgh	2.25	2.25	2.35	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel, *Per Lb. to Large Buyers:*	Dec. 2, 1930 Cents	Nov. 25, 1930 Cents	Nov. 3, 1930 Cents	Dec. 3, 1929 Cents
Sheets, black, No. 24, P'gh	2.35	2.35	2.35	2.75
Sheets, black, No. 24, Chicago dist. mill	2.45	2.45	2.45	2.85
Sheets, galv., No. 24, P'gh	2.95	2.95	2.95	3.40
Sheets, galv., No. 24, Chicago dist. mill	3.10	3.10	3.10	3.50
Sheets, blue, No. 13, P'gh	2.05	2.05	2.05	2.35
Sheets, blue, No. 13, Chicago dist. mill	2.15	2.15	2.25	2.45
Wire nails, Pittsburgh	1.90	1.90	1.95	2.40
Wire nails, Chicago dist. mill	*1.95*	2.00	2.00	2.45
Plain wire, Pittsburgh	2.30	2.30	2.30	2.40
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.45
Barbed wire, galv., P'gh	2.60	2.60	2.60	3.05
Barbed wire, galv., Chicago dist. mill	2.75	2.75	2.75	3.10
Tin plate, 100 lb. box, P'gh	$5.00	$5.00	$5.00	$5.35
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$12.75	$12.75	$13.75	$15.25
Heavy melting steel, Phila	*11.50*	12.00	11.50	14.50
Heavy melting steel, Ch'go	10.00	10.00	10.50	12.50
Carwheels, Chicago	11.75	11.75	12.50	13.50
Carwheels, Philadelphia	14.00	14.00	15.00	15.50
No. 1 cast, Pittsburgh	12.50	12.50	12.75	14.50
No. 1 cast, Philadelphia	12.00	12.00	12.00	15.00
No. 1 cast, Ch'go (net ton)	9.50	9.50	10.00	13.50
No. 1 RR. wrot., Phila	13.50	13.50	14.00	15.50
No. 1 RR. wrot., Ch'go (net)	8.50	8.50	9.00	12.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.50	$2.50	$2.60	$2.65
Foundry coke, prompt	3.50	3.50	3.50	3.75
Metals, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Lake copper, New York	12.12½	12.12½	9.62½	18.12½
Electrolytic copper, refinery	*11.25*	10.25	9.25	17.75
Tin (Straits), New York	*25.87½*	26.12½	25.75	39.37½
Zinc, East St. Louis	*4.07½*	4.10	4.25	6.00
Zinc, New York	*4.42½*	4.45	4.60	6.35
Lead, St. Louis	4.95	4.95	4.95	6.10
Lead, New York	5.10	5.10	5.10	6.25
Antimony (Asiatic), N. Y.	*7.10*	7.15	7.12½	8.62½

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

before the middle of the month, and mills are understood to have been assured of their individual percentages. The local rail mill is gradually increasing its operations, but production will not be pushed until after the first of the year. Specifications for track accessories are light, and little new buying is before the trade.

Bolts, Nuts and Rivets

Consumers are not yet showing interest in their first quarter requirements, and producers are making little effort to hasten buying. It is understood that first quarter quotations will be unchanged, and the market is well maintained at recent levels. The industry is operating at 35 to 40 per cent of capacity.

Cold-Finished Steel Bars

Producers have not opened their books for first quarter, and no official price announcement is expected. The market reflects the recent stabilization in hot-rolled bars, and cold-finished stock is well established at a minimum of 2c., Pittsburgh, with 2.10c. still applying on considerable tonnage. No change is reported in the character of demand, and present specifications are sufficient to maintain an operating rate of about 35 per cent for the industry.

Tubular Goods

Pipe shipments in November were generally curtailed, although a few large line pipe orders are left to be filled, and some mills will be able to operate well into January on this business. Demand for buttweld pipe is very quiet, but makers expect some improvement in January. The failure of buttweld demand to show its usual seasonal increase this fall seriously curtailed the year's shipments, which are running about 25 per cent behind those of 1929. Lapweld mills are engaged in a limited way, and loss of business to seamless and electricweld units prevents any immediate future activity. Mechanical tubing is quiet, but shipments of boiler tubes are holding up fairly well, and prospective locomotive buying will lead to considerable improvement in that line.

Wire Products

Wire makers have not officially opened their books for first quarter, but are willing to negotiate for that period at current price levels. Consumer interest is generally lacking and mills are not pressing for orders because of the possible weakening effect on quotations. Current specifications are light and are expected to decline further this month, particularly where the jobbing trade is concerned. Demand from manufacturers is small, but fairly steady. Nails are holding in this district at $1.90 a keg, Pittsburgh, while plain wire is still quoted at 2.30c., Pittsburgh, subject to some shading.

Sheets

Some speculative inquiry has developed in the sheet market and a few buyers have expressed willingness to cover for the first six months of 1931 at present price levels. Mills are quick to turn down such offers and are not even anxious to take contracts for the entire first quarter, even though books are open for that period. A few contracts have already been entered, but buyers are more or less apathetic unless sheets are wanted for some specific purpose such as railroad car building. Current demand is very light and spot sales for this month's shipment are

THE IRON AGE COMPOSITE PRICES

	Finished Steel	Pig Iron	Steel Scrap
Dec. 2, 1930	2.135c. a Lb.	$16.02 a Gross Ton	$11.42 a Gross Ton
One week ago	2.135c.	16.11	11.58
One month ago	2.135c.	16.29	11.92
One year ago	2.362c.	18.29	14.08
	Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1930	2.362c., Jan. 7	2.135c., Oct. 14	$18.21, Jan. 7	$16.02, Dec. 2	$15.00, Feb. 18	$11.42, Dec. 2
1929	2.412c., April 2	2.362c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.391c., Dec. 11	2.314c., Jan. 3	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.453c., Jan. 4	2.293c., Oct. 25	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22
1926	2.453c., Jan. 5	2.403c., May 18	21.54, Jan. 5	19.46, July 13	17.25, Jan. 5	14.00, June 1
1925	2.560c., Jan. 6	2.396c., Aug. 18	22.50, Jan. 13	18.96, July 7	20.83, Jan. 13	15.08, May 5

generally being made at minimum quotations.

On contract tonnage more efforts are being made to secure the top price in quotation ranges. This is particularly true in the case of galvanized sheets on which a number of mills are adhering to 3c., Pittsburgh, on forward contracting. On current orders considerable tonnage is being taken at 2.90c. Recently announced prices on the other finishes are being generally adhered to. Sheet mills in Pittsburgh and nearby districts are running at 35 to 40 per cent of capacity with a number of units in the Valleys completely suspended.

Tin Plate

Contracting for 1931 is still somewhat restricted, but is characterized as satisfactory by most makers. Current specifications are light and mill operations average 40 to 45 per cent of capacity. One large independent company plans a capacity operation in the two weeks preceding Christmas to provide holiday funds for its employees.

Strip Steel

As they enter what will certainly be the worst month of the year, strip makers are centering their interest on January prospects, but report little concrete evidence of the expected upturn in orders. Current operations are not averaging above 35 per cent of capacity. Shipments to the automobile industry for December have been partially completed and some January inquiry has developed from that source. In a number of cases requirements for next month reflect a sharp increase. Prices are well maintained on future business at 1.55c. to 1.60c., Pittsburgh, for hot-rolled strip 6 in. and wider and 1.65c. to 1.70c., on the narrower widths. On cold-rolled, quotations range from 2.25c. to 2.35c., Pittsburgh.

Coal and Coke

Cold weather has stimulated demand for heating coke and domestic coal in the last week and shipments have been in good volume. Furnace and foundry coke remain very dull, although a number of Eastern buyers of the furnace grade have come into the market for their first half requirements. Shipments of foundry coke seem to be a trifle heavier, although foundry operations are not noticeably higher. Price on foundry coke range from $3.25 to $4.85 a net ton, Connellsville, while the furnace grade is unchanged at $2.50 on spot tonnage.

Old Material

The scrap market is very dull, with the exception of some activity in low phosphorus specialties Several dealers are having difficulty buying these grades to cover recent orders as the supply seems to be rather limited. Some bids by dealers of around $16 are reported, but recent sales have been made at this price and others are said to have brought even lower figures. The other grades are generally unchanged, with the $12.50 to $13 quotation on heavy melting steel largely nominal. Some dealers are having difficulty in covering recent $13 orders at a profit, but odd cars of scrap can be picked up for less than $12.50. Hydraulic compressed sheets are weaker in the absence of demand in this district, although there is no surplus in the market. The December list of the Pennsylvania Railroad, closing Dec. 3, contains 24,800 tons of scrap, but is without offerings of No. 1 heavy melting steel and rails for the second consecutive month. The Norfolk & Western list, closing Dec 10, contains 5250 tons.

Warehouse Prices, f.o.b. Pittsburgh

	*Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.75c.
Reinforcing steel bars	2.75c.
Cold finished and screw stock—	
Rounds and hexagons	3.35c.
Squares and flats	3.85c.
Bands	3.10c.
Hoops	4.10c.
Black sheets (No. 24), 25 or more bundles	3.15c. to 3.25c.
Galv. sheets (No. 24), 25 or more bundles	3.75c. to 3.85c.
Light plates, blue annealed (No. 10), 1 to 24 plates	2.75c.
Blue annealed sheets (No. 13)	2.65c.
Galv. corrug. sheets (No. 28), per square	4.25c.
Spikes, large	2.65c.
Small	3.05c. to 4.50c.
Boat	3.15c.
Track bolts, all sizes, per 100 count,	60 and 10 per cent off list
Machine bolts, 100 count,	60 and 10 per cent off list
Carriage bolts, 100 count,	60 and 10 per cent off list
Nuts, all styles, 100 count,	60 and 10 per cent off list
Large rivets, base per 100 lb.	$3.30
Wire, black, soft ann'l'd, base per 100 lb.	$2.40 to 2.50
Wire, galv. soft, base per 100 lb.	2.85 to 2.95
Common wire nails, per keg	2.25
Cement coated nails, per keg	2.45

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$12.50 to $13.00
No. 2 heavy melting steel	10.50 to 11.00
Scrap rails	12.00 to 12.50
Compressed sheet steel	12.00 to 12.50
Bundled sheets, sides and ends	10.00 to 10.50
Cast iron carwheels	13.50 to 14.00
Sheet bar crops, ordinary	13.50 to 14.00
Heavy breakable cast	9.00 to 9.50
No. 2 railroad wrought	12.50 to 13.00
Hvy. steel axle turnings	10.50 to 11.00
Machine shop turnings	6.00 to 6.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	15.50 to 16.50
Railr. coil and leaf springs	15.50 to 16.50
Rolled steel wheels	15.50 to 16.50
Low phos. billet and bloom ends	17.00 to 18.00
Low phos. mill plates	15.00 to 16.00
Low phos. light grades	15.00 to 16.00
Low phos. sheet bar crops	16.00 to 17.00
Heavy steel axle turnings	10.50 to 11.00
Electric Furnace Grades:	
Low phos. punchings	15.00 to 15.50
Heavy steel axle turnings	10.50 to 11.00
Blast Furnace Grades:	
Short shoveling steel turnings	7.50 to 8.00
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings	7.50 to 8.00
Rolling Mill Grades:	
Steel car axles	18.00 to 18.50
Cupola Grades:	
No. 1 cast	12.00 to 13.00
Rails 3 ft. and under	14.00 to 14.50

Burton Griffiths & Co., Ltd., Birmingham, England, who represent a number of American machine tool manufacturers, have occupied a new building in Birmingham especially designed for floor display of shop equipment.

CHICAGO

Ingot Output Still Tapering—Bars, Shapes and Plates May Be Advanced

Steel output still highly irregular and inclined downward. Sales of steel very light.

* * *

Some talk of an advance of $1 a ton on bars, shapes and plates.

* * *

Railroad expansion of shop activities bringing orders for repair material.

* * *

Forward buying in pig iron assuming a major covering movement and brings intimation of possible price advance.

* * *

Scrap market still in doldrums, with no likelihood or early improvement.

CHICAGO, Dec. 2.—Seasonal influences are beginning to bear heavily upon the iron and steel market, which has lacked the support usually experienced in the fall months. Notwithstanding that releases of rails are growing, now affording output at 30 per cent of capacity, ingot production is highly irregular, and this week must be measured by the range of 40 to 45 per cent of capacity. Use of plates at a comparatively high level, but demand for structural materials and the products of bar mills is depressed, with nothing of importance in sight now that would indicate a change for the better until the early part of 1931.

Prices, especially for plates, shapes and bars, are better established than at mid-November, and reports are heard that sellers may advance quotations $1 a ton.

Consumers steadfastly hold to the practice of placing business only for quantities that can be used in the near future. Sales of finished steel products in the week were very slow, probably a reflection of the approaching inventory period and holiday season, and specifications were not encouraging and showed seasonal irregularity.

Probably the most encouraging news of the week comes from the railroads. Expansion of shop activity continues, with the announcement by the Rock Island that in the first two weeks of December 2000 men will be reemployed on half time. This move and others of similar character are already bringing railroads into the market for miscellaneous steel needs for locomotive and car repairs.

Ferroalloys

This market is at a standstill while word on new contract prices is awaited. Releases are being pared very closely as the end of the year approaches.

Pig Iron

Forward buying is spreading from the largest purchasers to those who customarily buy from 1000 to several thousand tons for a quarter. In fact, it can almost be said that the present buying movement is assuming close to major proportions. Northern iron prices are well established at $17.50 a ton, local furnaces, and, according to the belief of some, an advance of 50c. a ton is not improbable. A Western melter has ordered about 20,000 tons, and several purchases of 4000 to 5000 tons have been closed. A contract for Southern iron calls for 3000 tons at $10.50 a ton, Birmingham. A local melter will purchase 1000 tons of malleable and foundry iron. A 3000-ton cargo of Lake Erie iron has arrived at a Chicago dock.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$17.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.00
Malleable, not over 2.25 sil.	17.50
High phosphorus	17.50
Lake Super. charcoal, sil. 1.50	27.04
S'th'n No. 2 fdy	17.51
Low phos., sil. 1 to 2 copper free	$28.50 to 29.20
Silvery, sil. 8 per cent	26.79
Bess. ferrosilicon, 14-15 per cent	35.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Plates

Reports are persistent that railroad equipment buying on a large scale is in the making. It is not improbable that the Illinois Central will renew its request for prices on 2200 cars and there is some promise that the Santa Fe may expand its inquiries. The Milwaukee road is also named as a potential buyer in both the car and locomotive markets. Attention is also being drawn to probable purchases by the Van Sweringen lines, which last year carried out only part of a heavy program. A Midwestern tank fabricator has ordered 5000 tons of plates and reports his shop schedule the best in many months. Although plate mill backlogs are larger than those in other heavy rolled products, shipments may be had on short notice.

Cast Iron Pipe

A few municipalities whose plans had been well developed have entered the market for tonnages that are to be delivered promptly. Three contracts have been taken by the Central Foundry Co., which will supply 6500 tons of 6, 8 and 12-in. pipe to Inkster, Mich., 150 tons of 10 and 16-in. pipe to Huron, S. D., and 350 tons of 8-in. pipe to Delphi, Ind. Bids on 900 tons of 12-in. pipe for Chicago will be opened Dec. 5. New public projects in Wisconsin are rapidly taking shape and it is probable that prices on sizable tonnages will be asked for in the early months of the new year. Figures are being taken on 3000 ft. of 12-in. pipe by Lawrenceburg, Ind.

Of special interest are preliminary steps being taken by public utilities in anticipation of making known their needs for the coming year. It is reported that budgets are well advanced and that contracting will be under way in the next 10 days to two weeks. There is a stronger tone in prices of cast iron pipe, especially when small tonnages are involved. Water pipe 6 in. and over is being quoted at $36 to $38 a ton, Birmingham, or $44 to $46 a ton, delivered Chicago.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $44 to $46; 4-in., $47 to $49; Class A and gas pipe, $3 extra.

Sheets

Consumers' needs are growing lighter as the holiday season approaches. The Milwaukee mills will go down this week for the remainder of the year and other Chicago district hot mills find barely enough specifications to hold output between 40 and 45 per cent of capacity. Prices on blue annealed and black sheets continue to show a spread, with one local producer holding to the high figure of the spread. Noteworthy in this week's business was the purchase of 1000 tons of sheets for railroad car roofing.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.50c. to 2.60c.; No. 24 galv., 3.15c.; No. 10 blue ann'l'd, 2.05c. to 2.15c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Reinforcing Bars

The price structure is undergoing further pressure for the reason that dealers are being forced by the character of the market to restrict activity to bidding on small tonnages. Orders for 10 to 25 tons are as keenly contested now as were those of several hundred tons when they were more numerous. The result is that prices formerly applying to tonnage lots are now being quoted on less than carloads. Shop operations have dropped to 40 per cent of capacity and are continuing in their down-

ward trend. The Midwest has experienced its first zero weather, which checks construction work, not because it cannot be carried on in winter, but mainly for the reason that cold weather runs up construction costs. Both inquiries and awards this week consist of scattered and small lots.

Bars

The bar market shows little change from a week ago. Specifications, except for iron bars, are ample to support output at a steady rate. New buying continues to drag, as consumers are interested only in what they can use in the current month.

Structural Material

Awards, at 6000 tons, mark improvement, but inquiries are falling sharply as the end of the year approaches. Included in business placed this week is 1600 tons by the Great Northern for 1931 bridge work, 2000 tons for a power plant addition at Minneapolis and 1000 tons for a steel mill building at Chicago. Progress is slow on the remaining World's Fair buildings. The South Park Commission, Chicago, is being delayed on its part of the Randolph Street viaduct pending relocation of railroad tracks.

Some of the steel producers count 25,000 tons of active inquiries in this market and an additional 80,000 tons that will soon come out for figures. The difficulty of financing projects detracts somewhat from estimates of this kind.

Warehouse Business

Warehousemen are experiencing the seasonal decline in business which usually begins early in November and often extends to mid-January. Warehouse prices on bars, plates, shapes and blue annealed sheets have been marked down $2 a ton at Milwaukee. The quotations now are 2.80c. a lb. for bars, 2.90c. for plates and shapes and 3.25c. for blue annealed sheets.

Hot-Rolled Strip

Local producers are meeting the lower prices recently made to the east of Chicago. Strips 6 in. and narrower are priced at 1.75c. to 1.80c. a lb., Chicago, and strips wider than 6 in. are 1.65c. to 1.70c. Specifications are slightly heavier than a week ago.

Rails and Track Supplies

Releases against rail contracts continue to expand slowly and Western rail mills are now producing at 30 per cent of capacity, a gain of five points in the week. Some railroads are contemplating taking larger quantities and there is promise that output may expand as December advances. Fresh inquiries include 5000 tons for the Chicago Great Western and 8000 for the Kansas City Southern. The Wabash inquiry for 10,000 tons is expected to be closed very shortly.

As a whole, the rail program is dragging and the week closes without purchases of note in the Western market. New business in track accessories is light, the aggregate tonnage being less than 1500 tons. A few carloads of light rails have been ordered in this market.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 1.95c.; angle bars, 2.75c.

Cold-Rolled Strip

Quotations now range from 2.25c. to 2.35c. a lb., Cleveland, or 2.53c. to 2.63c., delivered Chicago. This market remains quiet, with output not over 30 per cent of capacity.

Wire Products

Output of these commodities remains in the range of 40 to 45 per cent of capacity. Releases by the manufacturing trade have made no gain in the week, while distribution by jobbers is tending downward as is usual at this time of year. Manufacturers of nails are expecting that jobbers will soon move to round out stocks in anticipation of the miscellaneous pick-up business that usually can be counted on from dealers in the winter months. Cold weather has effectively checked releases of woven wire fencing and fence posts. Most sizes of copper wire are moving slowly.

Bolts, Nuts and Rivets

Sellers of these commodities are now preparing first quarter contracts at unchanged prices. Specifications are shrinking, and spot buying is so quiet that it is really not a market factor. The increased use of welding in oil tank construction is cutting heavily into the business that rivet makers formerly could expect from tank shops.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.90c.
Reinforcing bars, billet steel	1.70c.
Rail steel reinforcement	1.50c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.35c.
Flats and squares	3.85c.
Bands ¼ in. (in Nos. 10 and 12 gages)	3.10c.
Hoops (No. 14 gage and lighter)	3.65c.
Black sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes (⅜ in. and larger)	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.

	Per Cent Off List
Machine bolts	60 and 10
Carriage bolts	60 and 10
Coach or lag screws	60 and 10
Hot-pressed nuts, sq., tap. or blank.	60 and 10
Hot-pressed nuts, hex., tap. or blank,	60 and 10
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	$2.30 to 2.55
Cement c't'd nails, base per keg	2.30 to 2.55

Coke

Shipments of by-product foundry coke are about at the level of last week. Zero weather in recent days points to heavier use of coke for heating. The contracting period has come to an end with prices well established at $8 a ton, local ovens.

Old Material

The scrap market is exceptionally dull. Heavy melting steel is moving to Gary in fair volume, but deliveries to mills in the immediate vicinity of Chicago are small and there is no prospect that they will increase soon. Brokers are offering this grade to mills at $10.50 a gross ton, delivered, but additional tonnages are not needed and are turned down, with no counter offers. The Chicago & North Western will dispose of 4000 tons of scrap.

Prices deliv'd Chicago district consumers:

Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel	$10.00 to $10.50
Shoveling steel	10.00 to 10.50
Frogs, switches and guards, cut apart, and misc. rails	11.25 to 11.75
Factory hyd. comp. sheets	8.50 to 9.00
Drop forge flashings	7.75 to 8.25
No. 1 busheling	7.50 to 8.00
Forg'd cast and r'l'd steel carwheels	13.50 to 14.00
Railroad tires, charg. box size	13.50 to 14.00
Railroad leaf springs cut apart	13.50 to 14.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	12.00 to 12.50
Coil springs	13.50 to 14.00
Electric Furnace Grades:	
Axle turnings	9.25 to 9.75
Low phos. punchings	11.50 to 12.00
Low phos. plates, 12 in. and under	11.50 to 12.00
Blast Furnace Grades:	
Axle turnings	5.75 to 6.25
Cast iron borings	4.00 to 4.50
Short shoveling turnings	4.75 to 5.25
Machine shop turnings	4.75 to 5.25
Rolling Mill Grades:	
Iron rails	11.00 to 11.50
Rerolling rails	12.50 to 13.00
Cupola Grades:	
Steel rails, less than 3 ft.	12.50 to 13.00
Steel rails, less than 2 ft.	13.00 to 13.50
Angle bars, steel	11.75 to 12.25
Cast iron carwheels	11.75 to 12.25
Malleable Grades:	
Railroad	12.25 to 12.75
Agricultural	11.25 to 11.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heavier	26.00 to 31.00

Per Net Ton

Rolling Mill Grades:	
Iron angle and splice bars.	10.50 to 11.00
Iron arch bars, and transoms	11.00 to 11.50
Iron car axles	20.00 to 21.00
Steel car axles	13.00 to 13.50
No. 1 railroad wrought	8.50 to 9.00
No. 2 railroad wrought	8.75 to 9.25
No. 1 busheling	6.50 to 7.00
No. 2 busheling	4.50 to 5.00
Locomotive tires, smooth	12.50 to 13.00
Pipes and flues	5.50 to 6.00
Cupola Grades:	
No. 1 machinery cast	9.50 to 10.00
No. 1 railroad cast	9.00 to 9.50
No. 1 agricultural cast	8.50 to 9.00
Stove plate	7.50 to 8.00
Grate bars	7.00 to 7.50
Brake shoes	7.25 to 7.75

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

CLEVELAND

Inquiry for Steel for First Quarter Beginning to Appear—A Few Contracts Made

CLEVELAND, Dec. 2.—Consumers are beginning to show an interest in first quarter contracts and some inquiry for that delivery has come out for steel bars, plates, shapes and sheets. Several of the Michigan automobile companies are now in the market for steel for the first quarter. None of the mills has yet announced its price on bars, plates and shapes for the coming quarter, but prices may be named within a day or two, and there is some talk of an advance of $1 a ton. Reaffirmation of present prices on alloy steel bars is expected.

Most sheet mills have adopted for the first quarter the prices previously named by some of the producers, although one is quoting 2.90c. on galvanized sheets as compared with a 3c. price previously named for that delivery. Present prices on hot-rolled strip have been named for the coming quarter. On cold-rolled strip there is a range of 2.25c. to 2.35c. in the minimum quotations for next quarter. Business so far taken for the coming quarter appears to be limited to a few sheet contracts.

Aside from the maintenance of a slight gain in the demand for sheets, the volume of business shows little change. One producer of the heavier rolled products reports a gain in volume of orders in November over October, but with others the tonnage entered was about the same as during the previous month. Cleveland mill operations are unchanged at 44 per cent of ingot capacity.

Orders for steel for delivery this month are expected to be light with a tendency to taper off during the latter part of the month, when many plants will shut down for inventories. However, a moderate amount of activity is looked for during the month in orders for steel for shipment in January.

Pig Iron

A moderate buying movement has developed for the first quarter, giving the market more life than it has shown for some time. One producer sold 8000 tons of foundry and malleable iron during the week, largely to foundries affiliated with the motor car industry in Indiana and Michigan. Inquiries aggregating 20,000 tons are pending, including several in lots of 1000 to 2000 tons. Present buying by some foundries appears to be of a semi-speculative character induced by the belief that prices will go no lower. While there is no evidence that an attempt will be made to advance prices in the near future, the market shows a firmer tone than for some time and there is less disposition among producers to underbid each other on business for highly competitive points.

The Lake furnace prices on foundry and malleable grades remain at $16 to $17 for Ohio and Indiana, while in Michigan there is a spread of $17.50 to $18. For Cleveland delivery, $17.50, furnace, remains the ruling quotation.

One producer reports a 10 per cent gain in specifications in November over October, but shipments by other furnaces were about the same during the two months. With inventory time and suspensions of foundry operations toward the end of the month, shipments in December are expected to fall below those of November.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$17.50
S'th'n fdy., sil. 1.75 to 2.25	17.51
Malleable	17.50
Ohio silvery, 8 per cent	25.00
Stand. low phos., Valley	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; $3 from Jackson, Ohio; $6.01 from Birmingham.

Bars, Plates and Shapes

Demand for the heavier rolled steel products is dull. Consumers are ordering in very small lots covering only current needs in order that they will have as little material in stock as possible at inventory time. Only one sizable structural award, 600 tons for a Cleveland school, is reported. There is little new inquiry, and few lettings in the building field are expected this month. An inquiry is out for a self-unloading Lake boat for the stone trade that will require 5000 tons of plates and shapes. This is the first inquiry for a large Lake boat that has come out in months. Lake shipyards also will require 2500 tons of plates for pending ship repair work. A portion of this tonnage has been placed. Bars are unchanged at 1.60c. to 1.65c., Cleveland, for outside shipment, the higher price prevailing for local delivery. Plates and shapes are firm at 1.60c., Pittsburgh.

Wire Products

Concessions of $2 a ton to 2.20c., Cleveland, on plain wire, which appeared recently, are still being made, although so far this price appears to be restricted to a limited number of buyers. Nails are quoted at $1.90 a keg to jobbers and $2 to the retail trade.

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	2.95c.
Soft steel bars	2.85c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex.	3.40c.
Cold-fin. flats and sq.	3.90c.
Hoops and bands, No. 12 to ¼ in., inclusive	3.10c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	*5.95c.
Black sheets (No. 24)	3.60c.
Galvanized sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.10c.
No. 9 ann'l'd wire, per 100 lb.	$2.35
No. 9 galv. wire, per 100 lb.	2.80
Com. wire nails, base per keg	2.25

*Net base, including boxing and cutting to length.

Sheets

Several additional mills have opened their books for the first quarter, and that considerable interest is being shown in contracts for that delivery is indicated by the number of inquiries that have come out from consumers who evidently feel that present prices are on the bottom. So far there has not been much contracting for the first quarter, although some business for that delivery has been placed in black and galvanized sheets.

New prices announced are generally the same as those reported last week, but one mill is naming for the first quarter the present ruling 2.90c. price on galvanized sheets. One or two others previously announced a 3c. price for the first quarter. Another mill that announced a 3.70c. price for steel furniture sheets has reduced this to the ruling 3.60c. price. Ruling minimum quotations for current orders are 2.35c. for black sheets, 2.05c. for blue annealed, 1.90c. for light plates, and mills are asking $2 a ton more for small lots. However, on black sheets 2.35c. still quite generally prevails as well as 3.30c. price on auto body sheets.

The moderate improvement in orders noted a week ago is still being maintained, being due largely to a better demand from the automotive industry. Inquiry is out for 500 to 600 tons of galvanized sheets for the Higbee Building, Cleveland.

Strip Steel

A few of the mills have opened their books for the first quarter at their present prices of 1.55c., Pittsburgh, for wide strip and 1.65c. for narrow, with a $1 a ton higher price for small lots. There is some irregularity in prices that are being named for cold-rolled strip. Some of the mills are quoting a spread of 2.25c. to 2.35c., Cleveland and Pittsburgh, the higher price for small lots, and others have named a minimum of 2.35c. On fender stock, 3.40c., which recently has been the minimum price, is being named for the coming quarter. Little, if any, interest is being shown in contracts. New orders are rather light.

Old Material

There is a limited amount of activity in the Valley district, where a Cleveland dealer sold a small tonnage

(*Concluded on Page* 1742)

NEW YORK

Pig Iron Purchases 10,500 Tons—A Few First Quarter Steel Contracts Made

NEW YORK, Dec. 2.—Low prices have again brought out some fairly large individual purchases of pig iron. Sales, mainly for first quarter, totaled 10,500 tons, compared with 12,000 tons in the previous week. The Burnham Boiler Corpn., Irvington, N. Y., the Central Foundry Co., New York, and the Essex Foundry, Newark, have each placed about 1500 tons. It is believed that most of the contracting by the larger companies has been completed, and the smaller melters are in no haste to commit themselves through next quarter. Pig iron shipments are tapering as suspensions for year-end inventories approach.

Competition remains severe, particularly in nearby New Jersey. New England iron from storage is being offered at between $18 and $19, delivered by truck at foundry door. Alabama iron ranges from $10.50 to $11, Birmingham; eastern Pennsylvania iron figures back to $16, furnace, and Buffalo iron, especially from storage, nets about $15 at furnace. In most parts of this district, however, $15.50 base furnace, is still the minimum going quotation on Buffalo iron.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$20.41 to $20.91
*Buff. No. 2, del'd east. N. J.	18.28 to 19.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	17.39 to 18.39
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	17.89 to 18.89

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Finished Steel

A few contracts for sheets and strip steel for the first quarter have been entered at the minimum prices recently announced by many of the mills. These are 2.35c., Pittsburgh, for black sheets, 1.55c. for wide hot-rolled strip and 1.65c. for narrower than 6 in. and 2.25c. for cold-rolled strip. Several definite orders for January shipment also have been booked, but consumers want little or nothing for the remainder of this month. On galvanized sheets, the price situation is not yet well clarified. Some of the mills are quoting 3c. for current business and first quarter, but jobbers are still able to place orders at 2.90c., and one mill is said to have named that figure as its first quarter contract price. Blue annealed sheets appear to be fairly steady at 1.90c. for No. 10 gage and 2.05c. for No. 13 gage.

Makers of bars, plates and shapes have not yet announced first quarter prices, but some action is expected this week. There were reports today (Tuesday) that a leading producer would name 1.65c., Pittsburgh, on these products, an advance of $1 a ton over current quotations.

Meanwhile, business is very meager. The New York Central has inquired for 50 locomotives and may come into the market for several thousand cars, but the car inquiry is not expected for some weeks at least. The New York Central's rail inquiry for about 125,000 tons may be issued this week.

Reinforcing Bars

Lettings are light, but a considerable amount of tonnage is pending —more than usual for this season. The general contract has been awarded for subway route 108, section 9, Queens, New York, but the steel, amounting to 600 tons, will not be bought until next spring.

For mill shipment, distributers of concrete bars quote 1.70c. a lb., Pittsburgh, on building and paving work, and 1.80c. on subway work (rail steel offered at $4 a ton less); for delivery from local stock, 2.35c. a lb., New York, up to 3.05c. a lb. for lots of less than 2 tons.

Warehouse Business

The tonnage of steel moved from warehouses in November reached about the same total as in the two previous months. In the past week buying has declined considerably, however, and unless there is considerable improvement in activity, December promises about the smallest total of the year. Prices are fairly well maintained, except on galvanized and blue annealed sheets, which are shaded $2 to $3 a ton when desirable orders are offered.

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars, small shapes	3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Blue ann'l'd sheets (No. 10)	3.25c. to 3.40c.
Black sheets (No. 24*)	3.65c. to 3.75c.
Galvanized sheets (No. 24*)	4.25c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	65
1 x 30 in. and smaller	65
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65
¾ x 20 in. and smaller	65
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.	$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

Cast Iron Pipe

A fair tonnage of inquiry from public utilities willing to accept winter delivery of pipe is expected, but only a small tonnage is actually in the market. Orders for about 7000 tons of gas pipe for the United Gas Improvement Co., Philadelphia, probably will be distributed among three or more makers. Despite lack of substantial buying and low operating rates of Northern foundries, prices are being maintained.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $37.90 to $38.90; 4-in. and 5-in., $40.90 to $41.90; 3-in., $47.90 to $48.90. Class A and gas pipe, $3 extra.

Coke

Colder weather has failed to stimulate furnace coke specifications materially, and foundries are taking less fuel as they approach the year-end inventory suspensions. Furnace coke prices range from $2.50 to $2.60 a net ton, Connellsville, and foundry coke quotations follow:

Special brands of beehive foundry coke, $4.70 to $4.85 a net ton, ovens, or $8.41 to $8.56 delivered to northern New Jersey, Jersey City and Newark, and $9.29 to $9.44 to New York and Brooklyn; by-product foundry coke, $9 to $9.40, Newark or Jersey City; $10.06, New York or Brooklyn.

Old Material

No. 1 heavy melting steel is being bought at $11 a ton, delivered eastern Pennsylvania, and brokers are offering $7.50 a ton, New York, or $11 a ton, delivered Coatesville, Pa., for heavy breakable cast. Shipments of this grade are moving to a consumer at Florence, N. J., with brokers offering $10.50, delvered, or $7.60 a ton, New York. Other grades of scrap are inactive and the prices unchanged.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel		$7.50
Heavy melting steel (yard)	$5.25 to	5.50
No. 1 hvy. breakable cast	6.75 to	7.50
Stove plate (steel works)		5.00
Locomotive grate bars		5.00
Machine shop turnings		3.50
Short shoveling turnings		3.50
Cast borings (blast fur. or steel works)		4.00
Mixed borings and turnings		3.25
Steel car axles		16.00
Iron car axles		19.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)		7.25
Forge fire		7.00
No. 1 railroad wrought		8.75
No. 1 yard wrought, long		7.75
Rails for rolling	9.25 to	9.75
Stove plate (foundry)		5.50
Malleable cast (railroad)	9.50 to	10.00
Cast borings (chemical)	8.50 to	9.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$13.00
No. 1 hvy. cast (columns, bldg. materials, etc.); cupola size	11.00
No. 2 cast (radiators, cast boilers, etc.)	10.50

PHILADELPHIA

Steel Buying Smaller—Pig Iron Price Lacks Strength

PHILADELPHIA, Dec. 2.—The volume of new business being booked by steel mills is the smallest in many weeks, but prices show little change, concessions as a rule appearing only on desirable tonnage. Operating rates of rolling mills in this district average about 40 per cent of capacity and in certain instances production is at a still lower level.

A fair tonnage of steel is coming into the market for construction projects. About 3000 tons of plates and 1200 tons of shapes in a gas holder at Conshohocken, Pa., for the Philadelphia Electric Co., have been awarded, the plates having been divided between mills at Conshohocken and Coatesville, Pa., and part of the shapes went to another eastern Pennsylvania mill. The Baldwin Locomotive Works has booked an order from the Reading Railroad for 10 large type locomotives. About $1,000,000 is to be spent by the Reading for a new station at Jenkintown and about 19 bridges.

Pig Iron

As most consumers of foundry iron are buying only for immediate needs, orders are at a minimum. Stocks in consumers' hands are small, however, and only a small part of first quarter requirements has been covered, so that improved buying is expected by the end of this month or early in January. Prices lack firmness. A substantial volume of present business is at $17.50 a ton, furnace, which applies on small tonnages for prompt delivery, but larger orders bring concessions to $17 a ton, especially when Southern competition is encountered. Occasional orders for first quarter delivery are still being placed. The American Engineering Co., Philadelphia, has closed on 500 tons of foundry iron. The Pennsylvania Railroad has bought 50 tons of silvery iron for Lancaster, Pa. Low phosphorus continues quiet, and basic iron users are well covered for the rest of the year.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$17.76 to $18.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	18.26 to 19.26
East. Pa. No. 1X	18.76 to 19.76
Basic (del'd east. Pa.)	17.75 to 18.25
Malleable	20.00 to 21.00
Stand. low phos. (f.o.b. east. Pa. furnace)	23.00 to 24.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Steel Bars

Buying of merchant bars is limited to small lots, and 1.60c., Pittsburgh, or 1.89c., Philadelphia, is currently quoted. Competition for reinforcing bars continues keen and, although certain mills have endeavored to adopt a firmer attitude on prices, distributers' quotations show a downward tendency, recent contracts having gone at 1.65c. to 1.70c., Pittsburgh, or 1.94c. to 1.99c., delivered Philadelphia. Rail steel bars offer little competition at today's prices, quotations ranging from 1.50c. to 1.55c., Franklin, Pa., or 1.79c. to 1.84c., Philadelphia.

Shapes

Although mills are seeking to maintain a minimum quotation of 1.70c., f.o.b. nearest mill to consumer, with occasional concessions of $1 a ton to large users, recent fabricated steel quotations have not reflected the firmer prices on plain material. A fair tonnage of fabricated structural steel business is in prospect in this district, including 8000 tons to be placed for a 30-story bank building, 5000 tons for the Locust Street subway station section and 4000 tons in the Market Street viaduct for the Pennsylvania Railroad.

Plates

The market is fairly well maintained at 1.70c., Coatesville, Pa., or 1.80½c., delivered Philadelphia, for current small purchases of plates. Desirable lots, however, usually bring a concession of $1 a ton to 1.65c., Coatesville, or 1.75½c., Philadelphia.

Sheets

Local sheet consumers evidently have sufficient material to carry them into January and, with inventory period approaching, are unwilling to replenish stocks. Radio manufacturers are further curtailing production schedules, as their business season nears the end, but expect to resume operations earlier next year than usual. One radio maker in this district plans to produce sets for 1931 in March. Black sheets are quoted at 2.35c., Pittsburgh, or 2.64c., Philadelphia, and galvanized are at 3c., Pittsburgh, or 3.29c., Philadelphia. To large jobbers and distributers, mills are, in most cases, granting $2 a ton concession, or 2.90c., Pittsburgh, on galvanized. Blue annealed sheets, No. 13 gage, are quoted at 2.05c., Pittsburgh, or 2.34c., delivered Philadelphia, and blue annealed plates, No. 10 gage, are 1.90c. to 2c., Pittsburgh, or 2.19c. to 2.29c., Philadelphia.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq., twisted and deform	2.50c. to 2.60c.
Cold-fin. steel, rounds and hex	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ⅛-in. inclu.	2.90c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.60c.
†Galvanized sheets (No. 24)	4.15c.
Light plates, blue annealed (No. 10)	3.05c.
Blue ann'l'd sheets (No. 13)	3.20c.
Diam. pat. floor plates, ¼-in.	5.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 40 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Imports

In the week ended Nov. 29, a total of 4720 tons of manganese ore was received at this port, of which 4711 tons came from West Africa and 9 tons from Greece. Pig iron arrivals consisted of 4899 tons from British India. A shipment of 5 tons of steel strips was received from Great Britain.

Old Material

The current price situation in heavy melting steel scrap is not clearly defined. Some business is under negotiation, and dealers are said to be willing to quote $11.50, delivered, but against this is a report of a purchase of 1000 tons by another mill, with a more favorable freight rate from most shipping centers, at $11, delivered. It is doubted, however, that a substantial tonnage could be bought at $11, and anything offered or sold at that price is more or less in the nature of distress tonnage or material that is being liquidated. In view of these circumstances, a flat price of $11.50 is believed to fairly represent the market. Other grades of scrap are inactive and unchanged in price.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$11.50 to $12.00
No. 2 heavy melting steel	9.50 to 10.00
Heavy melting steel (yard)	9.00 to 9.50
No. 1 railroad wrought	$13.00 to 14.00
Bundled sheets (for steel works)	9.00
Hydraulic compressed, new	10.00 to 11.00
Hydraulic compressed, old	9.00 to 9.50
Machine shop turnings (for steel works)	6.50 to 7.50
Heavy axle turnings (or equiv.)	10.50 to 11.00
Cast borings (for steel works and roll. mill)	7.50 to 8.00
Heavy breakable cast (for steel works)	11.00 to 11.50
Railroad grate bars	9.00
Stove plate (for steel works)	9.00
No. 1 low phos., hvy., 0.04% and under	19.00 to 20.00
Couplers and knuckles	16.50 to 17.50
Rolled steel wheels	15.50 to 16.00
No. 1 blast f'nace scrap	6.50 to 7.00
Wrot. iron and soft steel pipes and tubes (new specific.)	11.50 to 12.00
Shafting	18.00
Steel axles	20.50 to 21.00
No. 1 forge fire	11.00
Cast iron carwheels	14.00 to 14.50
No. 1 cast	12.00 to 12.50
Cast borings (for chem. plant)	14.00 to 14.50
Steel rails for rolling	13.50 to 14.00

BOSTON

Competition for Pig Iron Business Brings Out Lower Prices

BOSTON, Dec. 2.—Competition between Buffalo district, east of Buffalo and Alabama stacks for a 1000-ton order for No. 2X iron from a Vermont concern and a 700-ton malleable order from a Massachusetts machinery manufacturer the past week brought out some low prices. Buffalo malleable was offered as low as $15 a ton, furnace, and previous quotations of $15.50 a ton, furnace, on No. 2X were shaded. Alabama No. 2X was offered at less than $12 a ton, furnace. To secure these orders, furnaces east of Buffalo went a shade under the equivalent delivered prices. Aside from these tonnages, sales amounted to approximately 2100 tons, and interests east of Buffalo took most of this business. With one exception, iron sold was for first quarter delivery, the exception extending into May. No important tonnages are in prospect.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$20.41 to $20.91
*Buffalo, sil. 2.25 to 2.75	20.41 to 20.91
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
*Ala., sil. 1.75 to 2.25	21.11
*Ala., sil. 2.25 to 2.75	21.61
†Ala., sil. 1.75 to 2.25	17.25
†Ala., sil. 2.25 to 2.75	17.75

Freight rates: $4.91 all rail from Buffalo; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Fabricated Steel

The Boston Transit Commission this week will probably place 600 tons of plates for a 48-in. welded steel pipe line, bids for which have been closed.

Reinforcing Steel

Sales the past week again approximated 1000 tons. About 1000 tons is pending, and of this 165 tons for a Boston bath house, 225 tons for a Massachusetts State bridge, and 150 tons for a Fall River, Mass., post office are expected to be closed this week. The price situation is unchanged. Quotations on less than 100 ton lots of billet bars are generally maintained, but on round tonnages are subject to variation. From stock: 1 to 5-ton lots are 3c. a lb., base; 6 to 99-ton lots, 2.50c.; and 100-ton lots and larger, 2.15c. to 2.25c., mostly 2.15c. to 2.20c. Rail steel bar prices also are elastic, particularly for delivery outside common Boston freight rate points. For Boston and nearby delivery, such bars are 2.26½c. a lb.

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.36½c.
Structural shapes—	
Angles and beams	3.36½c.
Tees	3.36½c.
Zees	3.36½c.
Soft steel bars, small shapes	3.26½c.
Reinforcing bars	3.11½c. to 3.26½c.
Iron bars—	
Refined	3.26½c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tire steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	3.50c. to 5.50c.
Squares and flats	4.00c. to 6.00c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.80c.
	Per Cent Off List
Machine bolts	60 and 5
Carriage bolts	60 and 5
Lag screws	60 and 5
Hot-pressed nuts	60 and 5
Cold-punched nuts	60 and 5
Stove bolts	70 and 10

Cast Iron Pipe

Bridgewater, Mass., has awarded 500 tons of 6 and 8-in. pipe to the United States Pipe & Foundry Co., and Salem, Mass., has awarded 380 tons, mostly 16 in. pipe, to the Donaldson Iron Co. The latter foundry was the low bidder on 175 tons of 6 and 8-in. pipe required by Norwood, Mass. Hanson, Mass., closes bids Dec. 5 on 27,360 ft. of 6-in. and 29,500 ft. of 8-in. pipe, approximately 11 miles. The United States Pipe & Foundry Co. was low American bidder on the Bridgewater tonnage. French pipe interests quoted $36.75 a ton, delivered.

Old Material

Prices on machine shop turnings, steel mill borings, pipe, mixed borings and turnings, shafting and axles are uncertain, and the market for No. 1 heavy melting steel is more or less nominal due to the fact that there has not been enough business the past fortnight to establish quotations. Were it not for the fact that dealers have managed to secure a few car lot orders for No. 1 machinery cast, breakable cast and long bundled skeleton, the market might well be said to be at a standstill.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$6.50 to $7.00
Scrap T rails	6.50 to 7.00
Scrap girder rails	5.50 to 6.00
No. 1 railroad wrought	7.50 to 7.60
Machine shop turnings	2.10 to 2.60
Cast iron borings (steel works and rolling mill)	2.10 to 2.60
Bundled skeleton, long	6.00 to 6.50
Forge flashings	6.00 to 6.50
Blast furnace borings and turnings	2.00 to 2.10
Forge scrap	5.75 to 6.00
Shafting	12.50 to 13.50
Steel car axles	15.00 to 16.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	6.00 to 6.50
Rails for rolling	10.00 to 10.25
Cast iron borings, chemical	9.00 to 9.50
Prices per gross ton deliv'd consumers' yards:	
Textile cast	$11.00 to $11.50
No. 1 machinery cast	11.50 to 12.50
No. 2 machinery cast	9.50 to 10.50
Stove plate	8.00 to 8.50
Railroad malleable	13.00 to 13.50

BIRMINGHAM

Blue Annealed and Black Sheets Reduced $1 a Ton—Market Dull

BIRMINGHAM, Dec. 2.—A better movement of pig iron is assured for this week by the shipping instructions already accumulated. Sales are limited to December delivery, with the base price unchanged at $14, Birmingham. Fill-in tonnage requirements are light, and it is thought that several old contracts will be extended into the first quarter.

Furnace operations are without change, nine furnaces being on foundry iron and one on basic. Dec. 4 has been tentatively named as date for the blowing out of a merchant stack.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$14.00
No. 1 fdy., 2.25 to 2.75 sil.	14.50
Basic	14.00

Finished Steel

Demand slowed up some last week. Conditions in the jobbing trade are said to be responsible for this tapering off. Blue annealed and boxed annealed sheet prices are down $1 a ton, making the second decline of that amount within two weeks. Galvanized sheets remain at 3.15c., and bars, plates and shapes continue to hold at 1.75c. to $1.80c. Operations at finishing mills were slightly better at the close of November than at the beginning of the month. Rail tonnage is accumulating so slowly that no date has been named for starting up the Ensley rail mill.

Structural steel fabricating shops have made inroads on backlogs during the past two weeks. Awarding of contracts on five steel highway bridges in Tennessee has been delayed because funds are tied up by recent bank closings.

The Tennessee company has taken off one open-hearth at Fairfield, leaving four active of eight at that plant. All nine open-hearths at Ensley are still idle. The Gulf States Steel Co. is using four of six at Alabama City, but one of these is being used for accumulation of ingot reserves before it is taken off for rebuilding.

Cast Iron Pipe

Large orders were few last week, but the volume of new business held its own through an increase in orders of 25 to 50 tons each. Buying was mostly by municipalities. Municipal construction programs are being rushed to bring some unemployment relief, and the next two weeks promise more buying. Chicago is in the market for 900 tons of pipe; Beverly Hills, Cal., is to open bids Dec. 16 on 400 tons; Duluth, Minn., has called for new bids to be opened Dec. 5 on 1500 tons. No award has been announced here on 3350 tons of pipe for Los Angeles, on which bids were

opened Nov. 24. The American Cast Iron Pipe Co. has booked 200 tons for Hoquiam, Wash., and 150 tons for Kansas City, Mo. The United States Pipe & Foundry Co. is low bidder on upward of 600 tons for Memphis, Tenn., and has booked 150 tons for Lyons, Ohio. Shipments are off some from recent average, but they compare favorably with current production. Quoted prices remain at $37 to $38, Birmingham. Concessions are most frequent on large sizes and on large orders for delivery next year.

Old Material

Shipments are being held up. These suspensions are thought to be due to the approaching inventory period. Little activity of any sort is expected this month. Scrap steel rail quotations are off 50c. a ton at $10.50. Heavy melting steel is quoted at the former minimum figure of $10. Other prices are unchanged.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$10.00
Scrap steel rails	10.50
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	9.00
Steel axles	19.00
Iron axles	18.00
No. 1 railroad wrought	10.00
Rails for rolling	11.50 to 12.00
No. 1 cast	11.00 to 11.25
Tramcar wheels	11.00 to 11.25
Cast iron borings, chem.	13.50
Cast iron carwheels	11.00

Detroit Scrap Listless; Few Price Changes

DETROIT, Dec. 2.—The scrap market is listless, with prices of most items unchanged. Purchases are still being made by dealers for shipment to Buffalo by water. The local steel mill has a sizable stock, but is placing orders whenever it can acquire material cheaply.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$9.75 to $10.25
Borings and short turnings	4.75 to 5.25
Long turnings	3.75 to 4.25
No. 1 machinery cast	10.00 to 10.50
Automotive cast	11.50 to 12.00
Hydraul. comp. sheets	9.25 to 9.75
Stove plate	7.25 to 7.75
New No. 1 busheling	8.25 to 8.75
Old No. 2 busheling	3.50 to 4.00
Sheet clippings	6.50 to 7.00
Flashings	8.25 to 8.75

Genfire Steel Co., Youngstown, has been incorporated with the Truscon Steel Co. and will function as its dealer and commodity division under the direction of W. B. Turner, formerly manager of the Genfire Steel Co. The sales organization of the Genfire company has been merged with the Truscon sales organization.

Blair Strip Steel Co., New Castle, Pa., has ordered a 16-in. x 24-in. two-high cold rolling mill from E. W. Bliss Co., Brooklyn. The Dallas Brass & Copper Co., Chicago, has ordered an 8-in. x 21½-in. x 20-in. four-high roll stand and drive from the Bliss company.

CINCINNATI

Pig Iron Purchases Still Closely Restricted—Sheet Sales Improve

CINCINNATI, Dec. 2.—With the working week restricted by a holiday, bookings of district furnace representatives declined last week. Orders called for a total of 1600 tons of pig iron, of which three 100-ton lots were the largest. With buyers keeping purchases as low as possible to avoid large inventories, current business represents their needs for the next 30 days. In last week's business were two 100-ton orders for Southern iron, one from an Indiana consumer and the other from a central Ohio melter. A Huntington, W. Va., buyer took 100 tons of Northern iron. Prices on Southern iron appear to be based on $11.50, Birmingham, although silicon differentials are sometimes waived. The melt in this district continues to be low. The only inquiry before the trade is from Louisville, Ky., and calls for 200 tons of Southern iron.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$20.89 to $21.39
Ala. fdy., sil. 1.75 to 2.25	14.69 to 15.19
Ala. fdy., sil. 2.25 to 2.75	15.19 to 15.69
Tenn. fdy., sil. 1.75 to 2.25	14.69 to 15.19
S'th'n Ohio silvery, 8 per cent	24.39

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Steel

Sheet orders were larger during the last week than in the previous week. With demand slightly improved, operations have been increased, the district average being slightly over 50 per cent of capacity.

Old Material

With consumers for the most part out of the market, the demand for scrap is low. Present quotations are nominal. The Norfolk & Western Railroad is offering its usual list.

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	3.90c.
Bands	3.35c.
Cold-fin. rounds and hex.	3.80c.
Squares	4.30c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (25 kegs or more)	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$10.00 to $10.50
Scrap rails for melting	11.00 to 11.50
Loose sheet clippings	6.00 to 6.50
Bundled sheets	9.25 to 9.75
Cast iron borings	4.50 to 5.00
Machine shop turnings	5.50 to 6.00
No. 1 busheling	8.50 to 9.00
No. 2 busheling	5.00 to 5.50
Rails for rolling	12.00 to 12.50
No. 1 locomotive tires	12.00 to 12.50
No. 2 railroad wrought	10.00 to 10.50
Short rails	15.25 to 15.75
Cast iron carwheels	11.00 to 11.50
No. 1 machinery cast	14.50 to 15.00
No. 1 railroad cast	12.50 to 13.00
Burnt cast	7.00 to 7.50
Stove plate	7.00 to 7.50
Brake shoes	7.00 to 7.50
Agricultural malleable	12.50 to 13.00
Railroad malleable	13.50 to 14.00

ST. LOUIS

Wabash Inquires for 10,500 Tons of Rails—Market Generally Dull

ST. LOUIS, Dec. 2.—Makers of pig iron are hopeful that buying by melters, which has been conspicuous by its absence during the first two months of the last quarter, will pick up between now and the first of the year. Stocks in hands of melters are extremely low, and the feeling that they must buy, if they do any business at all, is helping to steady the market. Specifications against contracts continue to lag behind schedules. East Side consumers of basic iron are expected to make known their wants for first quarter shortly. Tractor plants in the district are said to be quite busy, which also means more business for wheel makers.

Finished Steel

The first of the railroads centering here to ask for prices on its 1931 rail and fittings requirements is the Wabash, whose inquiry issued this week is for 10,500 tons of 110-lb. rails, together with the necessary tie plates and spikes. The amount stated is half the amount required in 1930. It is not expected that other roads here will come into the market until after the turn of the year. Purchasing of other items by the railroads is extremely light. Mills are said to be holding firmly to their announced prices for plates, shapes and bars. A small number of inquiries for first quarter delivery are reported. Small jobs for relatively light tonnages rule

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.60c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.60c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.10c.
Galv. corrug. sheets	4.70c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50

among the fabricators of structural steel.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., deliv'd St. Louis	19.66
Southern No. 2 fdy., deliv'd	$15.42 to 15.92
Northern malleable, deliv'd	19.16 to 19.66
Northern basic, deliv'd	19.16 to 19.66

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Old Material

The scrap market is weaker, though prices are unchanged except on railroad malleable, which is 25c. lower. An East Side interest is said to have purchased a small tonnage of rails and specialties at a low price from a Chicago and St. Louis dealer. Not much buying is expected by the mills until after the turn of the year. Country dealers are shipping in virtually no material because of the low prices, and therefore there is no distress scrap.

Railroad lists include: Pennsylvania, 24,675 tons; Mobile & Ohio, 4000 tons; Atchison, Topeka & Santa Fe, 2795 tons; Cleveland, Chicago, Cincinnati & St. Louis, 2070 tons; Missouri-Kansas-Texas, 1000 tons; Chicago, Milwaukee, St. Paul & Pacific, 175 carloads, and Missouri Pacific, 56 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	$10.25 to $10.75
No. 1 heavy melting or shoveling steel	9.75 to 10.25
No. 2 heavy melting or shoveling steel	9.00 to 9.50
No. 1 locomotive tires	11.00 to 11.50
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	10.00 to 10.50
Railroad springs	12.50 to 13.00
Bundled sheets	6.50 to 7.00
No. 2 railroad wrought	9.75 to 10.25
No. 1 busheling	7.00 to 7.50
Cast iron borings and shoveling turnings	6.00 to 6.50
Iron rails	10.00 to 11.00
Rails for rolling	11.50 to 12.00
Machine shop turnings	3.50 to 4.00
Heavy turnings	8.00 to 8.50
Steel car axles	14.00 to 15.00
Iron car axles	20.50 to 21.00
Wrot. iron bars and trans.	12.50 to 13.00
No. 1 railroad wrought	7.50 to 8.00
Steel rails, less than 3 ft.	13.00 to 13.50
Steel angle bars	10.00 to 10.50
Cast iron carwheels	11.00 to 11.50
No. 1 machinery cast	10.50 to 11.00
Railroad malleable	10.00 to 10.50
No. 1 railroad cast	10.00 to 10.50
Stove plate	8.50 to 9.00
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	10.00 to 10.50

Plates

Only two plate awards were reported. The Birchfield Boiler Co. will fabricate 600 tons for a 30-in. welded steel pipe line for Tacoma. The Consolidated Steel Corpn. will fabricate a 40,000 bbl. tank for Pasadena, involving 100 tons. New inquiries were confined to lots of less than 100 tons. Prices are weak at 2.05c. to 2.15c., c.i.f.

Structural Shapes

The Judson-Pacific Co. has been awarded 261 tons for the Shell Drake Hotel, San Francisco. The McClintic-Marshall Co. will furnish 240 tons for an apartment house in Santa Monica, Cal., and 175 tons additional for the city light plant in Pasadena. Crest gates for a power project at Rock Island, Wash., involving 337 tons, will be fabricated by the Pacific Car & Foundry Co. Pending business exceeds 24,000 tons. Bids were opened on 787 tons for the Pulga River bridge in California and on 200 tons and 100 tons respectively for the Snoqualmie and Klickitat River bridges in Washington. Structural shapes range from 2.15c. to 2.25c., c.i.f.

Cast Iron Pipe

The only award of importance this week was 262 tons of 8 and 14-in. pipe for Hoquiam, Wash., the American Cast Iron Pipe Co. securing 236 tons and the Central Foundry Co. 26 tons. Los Angeles has opened bids on 3336 tons of 8 and 12-in. Class 150 pipe. San Francisco will open bids next week for 926 tons of 6 and 8-in. pipe. Bids will be opened Dec. 4 on 135 tons of 2-in. pipe for Long Beach, Cal. No award has yet been made on 134 tons for Renton, Wash.

Track Material

The Northern Pacific Railroad has placed 190,000 tie plates, or 1100 tons, with the Pacific Coast Steel Corpn. This company also booked 500 34-in. and 48 28-in. steel car wheels for the municipal railroad, San Francisco, at $34.70 and $26.25 respectively.

Cleveland office of the Chicago Bridge & Iron Works was moved recently to the Midland Bank Building. G. S. Sangdahl, district sales manager, has been in charge of this office since it was opened several years ago.

PACIFIC COAST

Large Steel Tonnages Expected Before End of the Year

SAN FRANCISCO, Nov. 29.—(*By Air Mail*)—Movement of steel products on the Pacific Coast was not especially heavy this week, but from present indications a considerable tonnage will be placed before the end of the year. Awards are expected within a week or two on 7500 tons of structural shapes for the Olympic Club, San Francisco, and on 3336 tons of cast iron pipe for Los Angeles. Little change is noted in the price structure.

Bars

Upward of 2800 tons of reinforcing steel was placed. This was the largest weekly total since the latter part of September. The Northwest Steel Rolling Mills secured 1700 tons and 130 tons respectively for the municipal light plant and a garage, both in Seattle. An unnamed interest took 800 tons for a school in Honolulu. Pending business calls for more than 7000 tons. Prices on out-of-stock material in both the Los Angeles and San Francisco districts continue unchanged at 2.50c., base, on carload lots. Merchant bar steel is not active, sales and inquiries being confined to small lots. On this class of material 2.10c. to 2.20c., c.i.f., prevails.

Pig iron prices per gross ton at San Francisco:

*Utah basic	$22.00 to $24.00
*Utah fdy., sil. 2.75 to 3.25	22.00 to 24.00
**Indian fdy., sil. 2.75 to 3.25	22.00 to 24.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.40c.
Black sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.80c.
Galv. sheets (No. 24)	5.00c.
Struc. rivets, ½-in. and larger	5.00c.
Com. wire nails, base per keg	$3.35
Cement c't'd nails, 100 lb. keg	3.35

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.25c.
Soft steel bars	3.15c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex.	3.15c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.60c.
Bands	3.50c.
Hoops	3.90c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$2.60
Black wire, base per 100 lb.	3.20

CANADA

Railroad Buying Expected to Improve Steel Business

TORONTO, Dec. 2.—Factors leading up to improvement in the Canadian iron and steel industry are beginning to make their appearance. Inquiries are now out for the purchase of materials for the construction at the London shops of 250 refrigerator cars for the Canadian National Railways. This work will be in conjunction with the turning out of 250 refrigerator cars and 10 locomotives at the Transcona shops at Winnipeg. It is also intimated that outside orders will be placed by the railway for the construction of other cars and locomotives. The Canadian Pacific is also expected to announce the placing of numerous orders for new equipment within a short time. Large rail orders are expected within the next few weeks.

Pig Iron

Business in this market has not yet shown a definite turn for the better, but sales in the past week had a slight gain over those of the week previous. Pig iron prices are unchanged, with the exception of basic iron at Montreal, which is now quoted at $20.50 a ton.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	20.50

Old Material

Dealers are now looking for renewed buying by consumers. The fact that the Hamilton mills are stocked up heavily with railway scrap tends to reduce this source of outlet for heavy melting steel, but occasional orders are appearing and regular shipments are being made by Toronto dealers to the Hamilton district. Turnings are dull, with practically no demand.

Dealers' buying prices for old material:

Per Gross Ton

	Toronto	Montreal
Heavy melting steel	$7.00	$6.00
Rails, scrap	7.00	6.00
No. 1 wrought	6.00	8.00
Machine shop turnings	2.00	2.00
Boiler plate	5.00	4.50
Heavy axle turnings	2.50	2.50
Cast borings	2.00	2.00
Steel borings	2.00	2.00
Wrought pipe	2.00	2.00
Steel axles	7.00	9.00
Axles, wrought iron	7.00	11.00
No. 1 machinery cast	....	10.00
Stove plate	....	8.00
Standard carwheels	....	8.50
Malleable	....	8.00
Per Net Ton		
No. 1 mach'ry cast	11.00	....
Stove plate	9.00	....
Standard carwheels	10.00	....
Malleable scrap	9.00	....

BUFFALO

Pig Iron Inquiries for First Quarter Appearing —Steel Operations Lower

BUFFALO, Dec. 2.—Pig iron sales the past week in this district amounted to 4000 or 5000 tons. Several medium-sized inquiries have come out, ranging from 500 to 1000 tons of foundry iron. Almost all of this inquiry is for first quarter delivery. Business is slightly better, although the foundry melt is not large. Southern iron is still considerable of a factor in the Eastern market. The Wickwire Spencer stack will probably go out of blast this week.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$17.50
No. 2X fdy., sil. 2.25 to 2.75	18.00
No. 1 fdy., sil. 2.75 to 3.25	19.00
Malleable, sil. up to 2.25	18.00
Basic	17.50
Lake Superior charcoal	27.28

Finished Steel

The average operation of Buffalo mills dropped during the past week when the Lackawanna plant of the Bethlehem Steel Co. took three of its open-hearths out of service, reducing its total from 11 to 8. This is the lowest operation at this mill in many years. The Donner plant of the Republic Steel Corpn. continues to operate five furnaces, the Wickwire Spencer company two, and Gould Coupler one. A local fabricator has booked 400 tons for an addition to the University of Buffalo buildings. A fair volume of small fabricated structural business has been awarded.

Old Material

This market has been very quiet. Material has been coming in satisfactorily against a recent order placed for No. 1 heavy melting steel at $11.50 and No. 2 heavy melting steel at $10. It is probable that the next price will be $11 for No. 1 heavy melting steel, although dealers profess to believe that the market has reached its bottom and that it will be virtually impossible to obtain material for a new order at $11. A few small sales of No. 1 machinery cast scrap are reported at $10.50 to $11. Scattered sales of stove plate have been made at $9.50.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:		
No. 1 heavy melting steel		$11.50
No. 2 heavy melting scrap		10.00
Scrap rails	$12.00 to	12.50
Hydraul. comp. sheets		10.00
Hand bundled sheets	8.00 to	8.50
Drop forge flashings		10.00
No. 1 busheling		10.00
Hvy. steel axle turnings	11.00 to	11.50
Machine shop turnings	6.00 to	6.50
No. 1 railroad wrought	10.00 to	10.50
Acid Open-Hearth Grades:		
Knuckles and couplers	13.00 to	13.50
Coil and leaf springs	13.00 to	13.50
Rolled steel wheels	13.00 to	13.50
Low phos. billet and bloom ends	15.00 to	15.50
Electric Furnace Grades:		
Short shov. steel turnings	8.50 to	9.00
Blast Furnace Grades:		
Short mixed borings and turnings	7.00 to	7.50
Cast iron borings	7.00 to	7.50
No. 2 busheling		6.00
Rolling Mill Grades:		
Steel car axles	15.00 to	15.50
Iron axles	19.00 to	19.50
Cupola Grades:		
No. 1 machinery cast	10.25 to	11.00
Stove plate	9.50 to	10.00
Locomotive grate bars	8.25 to	9.25
Steel rails, 3 ft. and under	15.00 to	15.50
Cast iron carwheels	13.50 to	14.00
Malleable Grades:		
Industrial	14.00 to	14.50
Railroad	14.00 to	14.50
Agricultural	14.00 to	14.50
Special Grades:		
Chemical borings	11.50 to	12.00

Buys 7,500,000 Lb. of Rolled Sheet Copper

An order for 7,500,000 lb. of rolled sheet copper for current and immediate future needs has been placed by Victor Manufacturing & Gasket Co., Chicago. This company's principal product, copper-asbestos gaskets, is widely used in the automotive field both on original equipment and for replacement.

John H. Victor, president, says, "Our feeling that there will be better prospects and an improvement in our business is such that we have felt warranted in making the purchase at this time to cover our needs for the next few months."

The Engineers' Society of Milwaukee has officially proposed to the mayor's advisory council of Milwaukee the establishment of a reference library to aid research into natural and applied sciences. The project is based upon the success of similar establishments in New York, Washington and Cleveland. It is estimated that the cost of a suitable building will be $1,000,000, with an initial investment of $250,000 in books and an annual maintenance and operating expense of $100,000.

McInnes Steel Co., Ltd., Corry, Pa., manufacturer of crucible tool steels, is undergoing a reorganization. Harry B. Smith, who has been with the company for about 25 years and who recently has been serving as secretary and treasurer, is in charge of the reorganization plan.

The International Nickel Co., Inc., New York, makes available, without cost, its monthly mimeographed compilation of "Literature and Patent References to Nickel." It was compiled by J. S. Negru. The October issue, which is Vol. 3, No. 15, comprises 54 pages.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$31.00
Rerolling, 4-in. and under 10-in., Youngstown	31.00
Rerolling, 4-in. and under 10-in., Cleveland	31.00
Rerolling, 4-in. and under 10-in., Chicago	32.00
Forging quality, Pittsburgh	36.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$31.00
Youngstown	31.00
Cleveland	31.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$31.00
Youngstown	31.00
Cleveland	31.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$36.00
Cleveland	36.00
Chicago	37.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	8c. to 9c.
Iron ore, low phos., Swedish, average 68% iron	11c.
Iron ore, basic Swedish, average 65% iron	9c.
Manganese ore, washed 52% manganese, from the Caucasus	26c. to 28c.
Manganese ore, Brazilian, African or Indian, basic 50%	26c. to 28c.
Tungsten ore, high grade, per unit, in 60% concentrates	$12.00 to $13.00

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3 crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2 delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.50 to $2.60
Foundry, f.o.b. Connellsville prompt	3.25 to 4.75
Foundry, by-products, Ch'go ovens	8.00
Foundry, by-products, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.35
Mine run coking coal, f.o.b. W. Pa. mines	1.40 to 1.50
Gas coal, ¾-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	.35 to .55
Gas slack, f.o.b. W. Pa. mines	.90 to 1.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$94.00 to $99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$30.00
Domestic, 16 to 19%	28.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		*Per Gross Ton Furnace*
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	39.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		*Per Gross Ton*
10%	$25.00	13%	$29.00
11%	26.00	14%	31.00
12%	27.00	15%	33.00

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		*Per Gross Ton*
6%	$21.00	11%	$24.00
7%	21.50	12%	25.00
8%	22.00	13%	27.00
9%	22.50	14%	29.00
10%	23.00	15%	31.00

Delivered prices at Chicago are about 50c. a ton below this schedule.

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.30 to $1.40
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$16.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	$17.00 to $17.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

Per 1000 f.o.b. Works

	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	73
†Carriage bolts	73
Lag bolts	73
Plow bolts, Nos. 1, 2, 3 and 7 heads	73
Hot-pressed nuts, blank or tapped, square	73
Hot-pressed nuts, blank or tapped, hexagons	73
C.p.c. and t. square or hex. nuts, blank or tapped	73
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	73
Semi-finished hexagon castellated nuts, S.A.E.	73
Stove bolts in packages, P'gh	80, 10, 10 and 5
Stove bolts in packages, Chicago	80, 10, 10 and 5
Stove bolts in packages, Cleveland	80, 10, 10 and 5
Stove bolts in bulk, P'gh	80, 10, 10, 5 and 2½
Stove bolts in bulk, Chicago	80, 10, 10, 5 and 2½
Stove bolts in bulk, Cleveland	80, 10, 10, 5 and 2½
Tire bolts	60, 10 and 10

Discounts of 73 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.75
F.o.b. Chicago	2.85

Small Rivets

(⅞-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

▲▲▲ Mill Prices of Finished Iron and Steel Products ▲▲▲

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
Del'd Philadelphia	1.89c.
Del'd New York	1.93c.
F.o.b. Cleveland	1.60c. to 1.65c.
F.o.b. Lackawanna	1.70c.
F.o.b. Birmingham	1.75c. to 1.80c.
C.i.f. Pacific ports	2.10c.
F.o.b. San Francisco mills	2.25c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft	1.70c.
F.o.b. Birmingham, mill lengths	1.75c. to 1.80c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.50c. to 1.55c.
F.o.b. Chicago Heights mill	1.60c. to 1.65c.
Del'd Philadelphia	1.84c. to 1.89c.

Iron

Common iron, f.o.b. Chicago	1.70c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.09c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c. to 1.80c.
Del'd Cleveland	1.78½c.
Del'd Philadelphia	1.80½c.
F.o.b. Coatesville	1.70c.
F.o.b. Sparrows Point	1.70c.
F.o.b. Lackawanna	1.70c.
Del'd New York	1.88c.
C.i.f. Pacific ports	2.05c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c. to 1.80c.
F.o.b. Lackawanna	1.70c.
F.o.b. Bethlehem	1.70c.
Del'd Cleveland	1.78½c.
Del'd Philadelphia	1.71c. to 1.76c.
Del'd New York	1.85½c.
C.i.f. Pacific ports	2.15c. to 2.25c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.65c. to 1.70c.
Wider than 6 in., P'gh	1.55c. to 1.60c.
6 in. and narrower, Chicago	1.75c. to 1.80c.
Wider than 6 in., Chicago	1.65c. to 1.70c.
Cooperage stock, P'gh	1.90c.
Cooperage stock, Chicago	2.00c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.00c. to 2.10c.
Bars, f.o.b. Chicago	2.00c. to 2.10c.
Bars, Cleveland	2.00c. to 2.10c.
Bars, Buffalo	2.00c. to 2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.25c. to 2.35c.
Strips, Cleveland	2.25c. to 2.35c.
Strips, deliv'd Chicago	2.53c. to 2.63c.
Strips, Worcester	2.50c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.40c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$1.90 to $2.00
Cement coated nails	1.90 to 2.00
Galvanized nails	3.95 to 4.05

	Base per Lb.
Polished staples	2.40c. to 2.50c.
Galvanized staples	2.60c. to 2.70c.
Barbed wire, galvanized	2.60c. to 2.70c.
Annealed fence wire	2.10c. to 2.20c.
Galvanized wire, No. 9	2.55c. to 2.65c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.30c.
Spring wire	3.30c.
(Carload lots, f.o.b. Chicago)	
Wire nails	$1.95 to $2.05
Annealed fence wire	2.40c. to 2.50c. (lb.)
Bright hard wire to manufacturing trade	2.35c.

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Light Plates

	Base per Lb.
No. 10, blue annealed, f.o.b. P'gh	1.90c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.00c.
No. 10, blue annealed, del'd Phila.	2.32c.
No. 10, blue annealed, B'ham	2.05c. to 2.10c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.05c. to 2.15c.
No. 13, f.o.b. Chicago dist.	2.15c. to 2.25c.
No. 13, del'd Philadelphia	2.34c. to 2.44c.
No. 13, blue annealed, B'ham	2.20c. to 2.25c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.35c. to 2.45c.
No. 24, f.o.b. Chicago dist. mill	2.45c. to 2.55c.
No. 24, del'd Philadelphia	2.64c. to 2.74c.
No. 24, f.o.b. Birmingham	2.50c. to 2.55c.

Steel Furniture Sheets

No. 24, f.o.b. P'gh	3.60c.

Galvanized

No. 24, f.o.b. Pittsburgh	2.90c. to 3.00c.
No. 24, f.o.b. Chicago dist. mill	3.10c.
No. 24, del'd Cleveland	3.08½c. to 3.18½c.
No. 24, del'd Philadelphia	3.24c. to 3.29c.
No. 24, f.o.b. Birmingham	3.15c.

Continuous Mill Sheets

No. 10 gage	1.75c.
No. 13 gage	1.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.65c. to 2.70c.
No. 28, f.o.b. Chicago dist. mill	2.75c. to 2.80c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.30c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	3.45c. to 3.55c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.70c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.00
Standard cokes, f.o.b. Gary	5.10

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)
(Per Package, 20 x 28 in.)

8-lb. coating I.C. $10.30	25-lb. coating I.C. $15.20
15-lb. coating I.C. 12.90	30-lb. coating I.C. 16.00
20-lb. coating I.C. 14.00	40-lb. coating I.C. 17.80

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(1¼% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bar	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅝ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	1.95
Angle bars	2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+11	+36
¼ to ⅜	53	27½	½	23	5
½	58	44½	¾	28	11
¾	62	50½	1 and 1¼	31	15
1 to 3	64	52½	1½ and 2	35	18

Lap Weld

2	57	45½	2	23	9
2½ to 6	61	49½	2½ to 3½	28	13
7 and 8	58	45½	4 to 6	30	17
9 and 10	56	43½	7 and 8	29	16
11 and 12	55	42½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+13	+48
¼ to ⅜	49	32½	½	23	7
½	55	44½	¾	28	12
¾	60	49⅛	1 to 2	34	18
1 to 1½	62	51½			
2 to 3	63	52½			

Lap weld, extra strong, plain ends

2	55	44½	2	29	13
2½ to 4	59	48½	2½ to 4	34	20
4½ to 6	58	47½	4½ to 6	33	19
7 to 8	54	41½	7 and 8	31	17
9 and 10	47	34½	9 to 12	21	8
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discount of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discount a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Fabricated Structural Steel

Awards of 21,000 Tons and New Projects Totaling 17,000 Tons Are Smallest Since September

NEW projects and awards of fabricated structural steel are smaller than in any week since September, with only 21,000 tons placed and about 17,000 tons of new business. New projects include transmission lines from Powerton to Crawford, Ill., for the Super-Power Co. of Illinois, 8000 tons, and a building for the Queens General Hospital, New York, 2500 tons.

Awards of structural steel this week include 1600 tons of bridges for the Great Northern Railroad, 1300 tons for the Medical Towers Building in Philadelphia and 1100 tons in an apartment building at 2 Horatio Street, New York. Awards follow:

North Atlantic States

BILLERICA, MASS., 350 tons, House of Correction, to Boston Structural Steel Co.

BOSTON, 255 tons, L Street bath house to A. L. Smith Iron Works.

NEW YORK, 635 tons, apartment building at 12 East Sixty-eighth Street, to Bethlehem Fabricators, Inc.

NEW YORK, 1100 tons, apartment building at 2 Horatio Street, to Taylor-Fichter Steel Construction Co.

NEW YORK, 190 tons, light supports in tunnel No. 2, to American Car & Foundry Co.

NEW YORK, 275 tons, three-story residence, 54-58 East Ninety-third Street, to National Bridge Works.

PHILADELPHIA, 1300 tons, Medical Tower building, to the American Bridge Co.

STATE OF MARYLAND, 350 tons, highway bridge, to Pittsburgh-Des Moines Steel Co.

BUFFALO, 400 tons, addition to University of Buffalo, to R. S. McMannus Steel Construction Co.; reported last week to another fabricator.

Central States

CLEVELAND, 600 tons, John Marshall High School, to Kilroy Structural Steel Co.

WHITING, IND., 200 tons, Standard Oil Co. of Indiana, to Vierling Steel Works.

HAMMOND, IND., 120 tons, W. J. Holliday Co., to Austin Co.

EVANSVILLE, IND., 5475 tons, Ohio River bridge, to American Bridge Co.; approaches still pending.

ROCK ISLAND, ILL., 750 tons, 10 barges for United States Engineer, to Midland Barge Co.

GREAT NORTHERN RAILROAD, 1600 tons, 1931 bridges, to American Bridge Co.

CHICAGO, 1000 tons, Wisconsin Steel Co., to Wisconsin Bridge & Iron Co.

LA GRANGE, ILL., 800 tons, viaduct, to Gage Structural Steel Co.

STATE OF IOWA, 500 tons, highway bridges, to Clinton Bridge Works, Rock Island Bridge & Iron Co. and Pittsburgh-Des Moines Steel Co.

HENDERSON, MINN., 260 tons, highway bridge, to an unnamed bidder.

HOKAH, MINN., 170 tons, highway bridge, to Worden-Allen Co.

MINNEAPOLIS, 2000 tons, Northern States Power Co., to Minneapolis-Moline Power Implement Co.

Western States

SAN FRANCISCO, 261 tons, Shell Drake Hotel, to Judson-Pacific Co.

ROCK ISLAND, WASH., 337 tons, crest gates, to Pacific Car & Fdry. Co.

TACOMA, WASH., 600 tons, plates, 30-in. welded steel pipe line, to Birchfield Boiler Co.

SANTA MONICA, CAL., 240 tons, apartment building, to McClintic-Marshall Co.

PASADENA, CAL., 175 tons, additional, city light plant, to McClintic-Marshall Co.

PASADENA, 100 tons, plates, 40,000-bbl. tank, to Consolidated Steel Corpn.

Export

HAVANA, CUBA, 400 tons, packing plant for Swift & Co., to Belmont Iron Works.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

North Atlantic States

BOSTON, 600 tons, plates, 48-in. welded steel pipe, for Transit Commission.

NEW YORK, 2500 tons, building for Queens General Hospital.

NEW YORK, 1000 tons, approach to McCombs Dam bridge.

NEW YORK, 100 tons, ferry slip and bulkhead, foot of Astoria Avenue, Long Island City, for Department of Plant and Structures.

NEW YORK, 100 tons, barracks at Fort Slocum.

SYRACUSE, N. Y., 400 tons, New York State College of Forestry.

PENNSYLVANIA RAILROAD, 4200 tons, viaduct on Market Street, West Philadelphia; American Bridge Co., low bidder.

LEWISBURG, PA., 600 tons, penitentiary.

BALTIMORE, 1400 tons, steamship pier.

The South

PENSACOLA, FLA., 200 tons, telephone building.

Central States

MANSFIELD, OHIO, 200 tons, theater and office building.

PEORIA, ILL., 500 tons, wharf boat for city; Howard Shipbuilding & Dry Dock Co. and Marietta Mfg. Co., low bidders.

CHICAGO, 8000 tons, transmission lines, Powerton to Crawford, Ill., for Super-Power Co. of Illinois.

DES MOINES, IOWA, 1800 tons, bank and office building.

BERLIN, WIS., 370 tons, Huron Street bascule lift span; bids close Dec. 11.

Reinforcing Steel

Awards of 4800 Tons—Pending Projects Light

LETTINGS of reinforcing steel the past week totaled 4800 tons, a slight increase over those in the previous week. The largest award was 1000 tons for a municipal electric light plant at Seattle. Contracts in November amounted to 22,050 tons, compared with 32,350 tons in October and 14,225 tons in September. New inquiries are light at 1200 tons. A few jobs are pending on which the tonnage is still being estimated. Awards follow:

PROVIDENCE, R. I., 320 tons, sewage disposal plant, to Truscon Steel Co.

BOSTON, 250 tons, Jamaica Plain high school, to Northern Steel Co.

BILLERICA, MASS., 200 tons, County institute, to Northern Steel Co.

BRENTWOOD, N. Y., 190 tons, tunnel, Pilgrim Hospital, to Kalman Steel Co.

WASHINGTON, 975 tons, House of Representatives office building; placed by Consolidated Engineering Co., Baltimore, with Truscon Steel Co.

QUANTICO, VA., 800 tons, United States Marine barracks, to Truscon Steel Co.

CLEVELAND, 190 tons, John Marshall School, to McClintic-Marshall Co.

SEATTLE, 130 tons, garage on Ninth Avenue, to Northwest Steel Rolling Mills.

SEATTLE, 1700 tons, city light plant, to Northwest Steel Rolling Mills.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

FALL RIVER, MASS., 150 tons, Post Office.

SOMERVILLE, MASS., 100 tons, hospital.

NEW YORK, 600 tons, subway route 108, section 9; general contract awarded to Arthur A. Johnson Corpn., New York.

CREEDMORE, N. Y., 110 tons, tunnel for State hospital; Williamsbridge Building Corpn., New York, low bidder on general contract.

AUBURN, N. Y., 500 tons, State prison; Wark Co., General Building, Philadelphia, low bidder.

CHILLICOTHE, OHIO, 700 tons, new buildings at Federal Reformatory.

KALAMAZOO, MICH., tonnage not stated, City Hall.

CHICAGO, 160 tons, Lutheran school. E. P. Strandberg, general contractor.

CHICAGO, 250 tons, Wendell Phillips High School; Lind Construction Co., general contractor.

MONROE, WIS., tonnage being estimated, theater and store.

FORT DODGE, KAN., tonnage being estimated, junior high school.

LOS ANGELES, 100 tons, apartment building, Menlo Street; bids being taken.

SACRAMENTO, CAL., 159 tons, highway work in Santa Barbara County; bids Dec. 17.

SAN FRANCISCO, 860 tons, Olympic Club; bids opened.

Allegheny Steel Co., Brackenridge, Pa., had net profit in the nine months ended Sept. 30 of $1,494,145, equivalent after preferred dividends to $2.16 a share on common stock. Third quarter earnings were not made public, while earnings in the second quarter totaled $667,905, equivalent to $1 per share.

The 11 establishments in the United States engaged primarily in the manufacture of graphite crucibles, retorts and stopper heads reported to the Bureau of Census an output valued at $2,820,566 in 1929. The 1927 production was valued at $1,982,135.

▲▲▲ Non-Ferrous Metal Markets ▲▲▲

Copper Stronger—Tin Inactive—Lead Steady—Zinc Lower

NEW YORK, Dec. 2.

Copper

A much stronger tone pervades the market. Custom smelters, who were selling electrolytic copper a week ago at 10.50c., delivered in the Connecticut Valley, have gradually advanced their quotations until today the price is 11.50c. Moderate sales have been made on each advance. Primary producers have adhered firmly to their 12c. quotation of a week ago and have also made some sales. The domestic market is not active, but there is more buying and more interest. Moderate amounts of metal in the hands of speculators have virtually disappeared, and the entire situation is considerably stronger.

There has been no change in the official price of Copper Exporters, Inc., which stands at 12.30c., c.i.f. usual European ports. Buying by foreign consumers, which fell off sharply when the domestic price went to 10.50c., has again increased and sales yesterday and today have been about 2000 tons. Buyers abroad are apparently convinced that the official price will hold. Total foreign sales for November are estimated at 71,000 tons, which is considerably more than the heavy sales in October.

Copper Averages

The average price of Lake copper for November, based on daily quotations in THE IRON AGE, is 11.12½c., delivered New York. The average price of electrolytic copper is 10.17c., refinery, or 10.42c., delivered in the Connecticut Valley.

Tin

Demand for tin is practically nil. Prices also are nearly stationary. Consumers show no interest despite the fact that prices are close to the low levels at which they bought heavily some weeks ago. They are well covered ahead and are cognizant of the fact that the supply of tin is very large. Spot Straits tin today was quoted at 25.87½c., New York.

Statistics for November show that deliveries into consumption in the United States were 6270 tons, with 5372 tons in stock and landing on Nov. 30. The total visible world supply on Dec. 1 is estimated at 40,811 tons, which is an increase of about 1200 tons for the month. Shipments from the Straits will probably approximate 7000 to 7500 tons, with the production about 6300 tons. Stocks in British warehouses on Nov. 29 were 22,379 tons, an increase of 131 tons for the week.

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Dec. 2	Dec. 1	Nov. 29	Nov. 28	Nov. 26
Lake copper, New York	12.12½	12.12½	12.12½	12.12½	12.12½
Electrolytic copper, N. Y.*	11.25	11.00	10.75	10.50	10.25
Straits tin, spot, N. Y.	25.87½	26.00	....	25.87½	25.87½
Zinc, East St. Louis	4.07½	4.07½	4.07½	4.07½	4.10
Zinc, New York	4.42½	4.42½	4.42½	4.42½	4.45
Lead, East St. Louis	4.95	4.95	4.95	4.95	4.95
Lead, New York	5.10	5.10	5.10	5.10	5.10

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Lead

Producers have opened their books to January delivery, but thus far very few orders have been taken. Business is confined to carload and small lots for early shipments, with a fair business reported. Prices are very firm, at 4.95c., St. Louis. The quotation of the leading interest is unchanged at 5.10c., New York.

Zinc

The bright spot in the zinc market, which has been declining rapidly of late, is the fact that forward bookings, at about 19,000 tons, are the smallest for any month this year. This compares with an estimated rate of consumption at present of about 17,000 tons a month. Prime Western zinc has declined to 4.07½c., East St. Louis, or 4.42½c., New York, but this is believed to be the bottom of the present movement. Demand is only fair. Prices for ore are unchanged at $26, Joplin, despite the fact that the surplus has been increased to about 46,990 tons. Shipments last week were only about 7200 tons, with production at 8400 tons.

Antimony

The market for Chinese metal is quiet, with quotations for spot delivery at 7.10c., New York, duty paid, with futures held at 7c.

Nickel

According to long-established prices, wholesale lots of ingot nickel are quoted at 35c. a lb., with shot nickel

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	18.67½c.
Copper, hot rolled, base sizes	21.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	23.25c.
Seamless Tubes—	
Brass	23.50c.
Copper	22.75c.
Brass Rods	16.87½c.
Brazed Brass Tubes	26.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	9.75c. to 10.25c.
Zinc sheets, open	10.75c. to 11.25c.

Metals from New York Warehouse

Delivered Prices, per Lb.

Tin, Straits pig	27.75c. to 28.75c.
Tin, bar	29.75c. to 30.75c.
Copper, Lake	12.75c. to 13.00c.
Copper, electrolytic	12.50c. to 12.75c.
Copper, casting	12.25c. to 12.50c.
Zinc, slab	5.75c. to 6.75c.
Lead, American pig	6.00c. to 7.00c.
Lead, bar	8.00c. to 9.00c.
Antimony, Asiatic	9.50c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	24.00c. to 25.00c.
Alum. ingots, No. 12 alloys	23.00c. to 24.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	19.00c. to 20.00c.

Metals from Cleveland Warehouse

Delivered Prices, per Lb.

Tin, Straits pig	30.25c.
Tin, bar	32.25c.
Copper, Lake	13.13c.
Copper, electrolytic	13.13c.
Copper, casting	12.75c.
Zinc, slab	5.50c. to 5.75c.
Lead, American pig	5.75c. to 6.00c.
Lead, bar	8.50c.
Antimony, Asiatic	11.50c.
Babbitt metal, medium grade	15.25c.
Babbitt metal, high grade	35.00c.
Solder, ½ and ½	19.75c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses. (Because of the uncertain market, prices quoted are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	9.00c.	10.00c.
Copper, hvy. and wire	8.75c.	9.75c.
Copper, light and bottoms	7.75c.	8.75c.
Brass, heavy	5.50c.	6.75c.
Brass, light	4.50c.	5.50c.
Hvy. machine composition	7.75c.	9.00c.
No. 1 yel. brass turnings	5.25c.	6.25c.
No. 1 red brass or compos. turnings	7.25c.	8.25c.
Lead, heavy	4.00c.	4.50c.
Lead, tea	2.50c.	3.00c.
Zinc	2.25c.	2.75c.
Sheet aluminum	7.50c.	9.50c.
Cast aluminum	6.00c.	8.00c.

at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum

Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Dec. 2.—This market remains quiet and, when movements of prices occur, the tendency is downward. Quotations on tin, zinc and antimony are lower than a week ago. Consumers are showing little interest in the old metal market.

Prices per lb. in carload lots: Lake copper, 12.12½c.; tin, 26.87½c.; lead, 5.05c.; zinc, 4.17½c.; in less-than-carload lots, antimony, 8.25c. On old metals we quote copper wire, crucible shapes and copper clips, 8c.; copper bottoms, 7c. to 7.50c.; red brass, 7c. to 7.50c.; yellow brass, 5c. to 5.50c.; lead pipe, 3.75c. to 4c.; zinc, 1.50c. to 1.75c.; pewter, No. 1, 15c.; tin-foil, 16c.; block tin, 22c.; aluminum, 6.50c. to 7c.; all being dealers' prices for less-than-carload lots.

Wage Incentive Plan for Maintenance Workers Is Successful

SINCE the application of a maintenance incentive plan by the Procter & Gamble Co., Cincinnati, two and one-half years ago, unit wage costs have shown an average reduction of about 36 per cent, said Stewart Lowry, head of the incentive department, in addressing a session on "Maintenance Incentives" before the Society of Industrial Engineers in Washington, Oct. 16. In all, the company has about 75 maintenance department men on standards. Premiums paid to operators were said to average about 14 per cent over the base wage. The total cost of making and maintaining these applications for two years has been about $29,000, against which savings of approximately $99,000 have been realized. Reducing these figures to an annual basis, Mr. Lowry said, the company gets an average cost of $14,600 against a return on the investment of $49,900, or approximately 341 per cent.

Plan Must Be Introduced with Care

"On the whole, we regard our maintenance incentives as entirely satisfactory, not only from the standpoint of savings, but also from the standpoint of the worker," said Mr. Lowry. "We believe they are sound in principle and that they are being fairly administered. The only suggestions I have to offer to anyone who is contemplating such work are that you assign your best available wage incentive engineer to the work and do not crowd him too fast for the first application.

"Because of the prejudice that incentives are not practicable for maintenance work, a bad start with inadequate or inapplicable standards may jeopardize the entire plan. The danger of labor trouble is also more likely to be present in a maintenance crew than in a production department, because the production operations are to a large extent peculiar to the industry, while maintenance crews include crafts or trades that are usually subject to the influence of organized labor and will quickly resent any injustices which might result from poor time-study work, even though there may be just as many errors in the other direction."

In the course of his opening remarks, Mr. Lowry said that, except for a few companies where incentive work is older and more generally used, interest in maintenance incentives is of relatively recent origin, and even now is confined almost solely to the larger companies. He cited five reasons for this. The fifth reason was said to be that, due to the varied nature of maintenance work, cost systems are likely to treat maintenance costs rather generally and therefore not likely to reflect accurately the effect of the incentive applications in terms of dollars and cents savings. This last reason was said to be one of the strongest arguments for maintenance incentives, because there is a natural tendency to adjust the productive labor force almost immediately with changes in volume of production, whereas there is much less likelihood that maintenance crews will be adjusted so promptly, if at all.

First Application on Repair of Valves

When the company reached the conclusion that there existed worthwhile savings possibilities in its repair and maintenance work, it selected for the first application a small group of five men who were engaged in repairing and reconditioning used valves. After naming some of the variables encountered, Mr. Lowry said time studies showed the necessity for standardization of methods and procedure. It was necessary, he said, to plan work more advantageously and to establish somewhat better control of the inventory of repair parts and materials. A complete classification was made first as to type of valve, then as to operations on each type. Sufficient time studies were made on a number of different sizes of each type to insure that the resulting operation standards were representative of average conditions. Knowing the number of used valves started in any lot, Mr. Lowry explained, a few inspections during the day, and an inventory of completed work turned into the storeroom at the end of the day, provided a satisfactory check on the day's performance.

Stock of Used Valves Greatly Reduced

When the wage incentive was started, it was pointed out, a fairly large building was used for the accumulation and storage of valves unfit for service. This building contained several carloads of valves representing work ahead for the group of five men. Due to lack of space in the machine shop, it was not convenient to increase the force on this job. The surplus store of used valves gradually diminished and was gone in about a year and at the same time all current work was maintained. Soon after application the force was reduced to four and then to three, where it remained until the surplus valves were all repaired. Since then or for a year and a half two men have handled all valve repair work for the company's Ivorydale factory. Other applications followed, Mr. Lowry said, including incentives for car repairs, painting, track repairs and tank building.

Before making the second application, relating to car cleaning, Mr. Lowry said he concentrated on the subject for three weeks, visiting 25 to 30 plants and talking with consulting engineers and other wage incentive authorities. He said he was surprised to find, with a few exceptions, that practically no serious efforts had been made to establish incentives on maintenance work.

Maintenance Incentive Plans Few

It was at the plant of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., where he received his first experience with maintenance incentives when he was employed there as a time-study engineer about 10 years ago, Mr. Lowry said, that he found the most sound and extensive maintenance incentive applications of all the companies visited. Briefly, he stated, his conclusions were that there was very little experience or precedent that his company could make use of and none that materially influenced the policies or methods which Proctor & Gamble had started. The problem after all, it was said, was only one of high-grade time-study work and careful administration of a sound wage incentive plan, involving the well known principles of careful analysis, standardization, measurement, proper compensation and control.

"We favor individual incentives where applicable, but use the group plan where the work is of a cooperative nature and where clerical work would be excessive to determine individual performance," said Mr. Lowry.

Another Drop in Automobile Output Expected This Month

DETROIT, Dec. 1.

INCREASED manufacturing activities by Chevrolet and Hudson are thought to have carried November production some 30,000 to 40,000 cars above the October total. This showing has been made in spite of declining operations by other companies, notably Ford.

Although it is somewhat early to judge the reception of its 1931 models, Chevrolet's program for December and January indicates it is confident in the public's acceptance of its product. The Oakland-Pontiac division of General Motors is said to have made large expenditures for new dies and tooling-up for next year's models. The November schedule called for 3000 units, but delay in getting into production made it impossible to carry this out. However, December should bring expansion of activities. It is not likely that the new cars will be shown until the January shows.

Nash reports that its usual week's shutdown for inventory purposes at the end of November was cut down to three or four days this year. The Studebaker plant at South Bend suspended operations the last half of November to take inventories. Willys-Overland is understood to be making samples of 1931 cars for dealers to be revealed in January.

The outlook for the automobile industry during the remainder of the year is not promising. Ford probably will be down the last two weeks of December, while Buick and Cadillac will close about the twentieth and will not resume production until after the holidays. Other makers also will probably suspend work during this period. In view of the fact that most of these companies usually shut down over the holidays, this news is neither surprising nor alarming. Nevertheless, it means that December may drop below the 154,000 mark of October, which was the lowest point of the year.

November automobile production probably was 30,000 to 40,000 cars above the October total.

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Many automobile plants will close as usual for inventory purposes the latter half of December, resulting in the month's output for the industry dipping to a new low for the year.

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Ford is expected to cut prices in the near future.

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Several automobile makers are considering substitution of cast iron for pressed steel brake drums on large passenger cars and heavy trucks.

Ford Expected to Cut Prices

IT is understood that Ford prices will be cut $25 to $50 in the near future. Selling at a lower price than ever before, the 1931 Chevrolet six is said to be taking considerable business away from model A. The new Essex, at less than $600, also is in a position to compete more actively in the low-priced market. Ford sales have been lagging because of seasonal conditions, impairment of the public's buying power and the downward trend of prices, which makes motorists hesitant about purchasing new cars.

Reports of a Ford eight persist, although admittedly it is not expected to be put on the market for a number of months. Most people scoff at the idea that it will be made at the Highland Park plant, which has virtually been abandoned. All of Ford's manufacture of raw and semi-finished materials and of car parts, as well as the machinery for assembling cars, is concentrated at the Rouge works and therefore it would be natural to use these facilities for getting low production costs.

Some Body Changes

THE new Hudson eight has 14 body types and comes in a dual series on respective wheelbases of 119 and 126 in. The Essex six comprises six body types on a 113-in. wheelbase. Both cars have more powerful engines and larger bodies, but are not changed much in appearance. W. J. McAneeny, Hudson's president, says that "we are literally invading a new price field. The consumer benefits most, but there is a safe margin of profit for distributer, dealer, salesman and the company. The point of diminishing returns has been found, which means that overproduction has been eliminated. The period of readjustment, I believe, is practically over."

Several automobile manufacturers are considering the substitution of cast iron for pressed steel brake drums on large cars. In fact, one company is said to have given orders for this change on its highest-priced line of passenger cars and heavy trucks. It is stated that pressed steel as a material for brake drums is not standing up as anticipated under the strain of heavy loads and does not give uniformity of service. It will be interesting to see whether this movement toward cast iron will assume formidable proportions or whether it will be confined within the ranks of a few makers.

The new Lincoln, to be shown by dealers the latter part of December, is 9 in. longer than the old, has a lower body, pointed radiator and slanting windshield to give it a fleeter appearance. It possesses the free-wheeling feature introduced by Studebaker and has steel spoke wheels as standard equipment. The engine, of the eight-cylinder, V type, is rated at 120 hp. as compared with 90 in the 1930 model. Window openings are framed with aluminum castings, giving greater rigidity.

In the bodies of the new Hudson and Essex models steel has replaced wood, even in the roof rails. Improved welding has made the bodies virtually one single piece of steel. In the Hudson pistons are of aluminum alloy and have cam-ground flexible skirts ground out round so as to resemble a double cam.

Pig Iron Shipments Decline

PIG iron shipments in November fell below those of October, decreased demand from malleable plants accounting for the difference. There is encouragement in the fact that a number of small foundries scattered through Michigan have resumed operations following prolonged shutdowns. Some of the large automobile foundries have been going outside the automobile industry seeking business. One Pontiac company has secured an order for the manufacture of gas engines, which will enable it to add several hundred workers to its payroll. The Oakland-Pontiac foundry, which has poured iron only a few days in the last five months, is reported to have a fair schedule ahead. A large automobile foundry in western Michigan is still idle; another important

foundry has been able to increase production somewhat in the last few weeks. The Cadillac foundry has piled enough castings to supply the company's requirements until after the first of the new year and consequently is closed. The Chevrolet gray iron foundry at Saginaw was down for a few days over the Thanksgiving holiday, but increased its output early in the week to offset this loss. It is said to be melting 900 tons of iron a day.

The Great Lakes Steel Corpn. continues to operate two open-hearth furnaces and its hot strip mill. Michigan Steel's sheet mills have been running at about 30 per cent of capacity. District steel offices seem more optimistic about the outlook, even though December automobile production is almost sure to drop to a new low. They are counting on some good first quarter orders to come through this month, although this business will not be reflected in shipments until January or February.

THE way in which companies are keeping inventories near the vanishing point is a constant source of amazement. A typical case is a foundry which recently secured an order on Monday and could not begin melting iron until a supply of coke arrived Tuesday morning. It didn't have enough coke on hand to operate even a single day. Another instance is a steel company which delivered some 100 sheets more than a customer had asked for in placing an order. Despite the fact that this amounted to little more than a ton of material and probably would be used within a week or two, the buyer insisted upon the steel company sending a truck to get the 100 sheets.

Front-Wheel Drive Attracts Mild Attention

Although the front-wheel drive has been successful so far as the Cord car is concerned, it is not considered likely that it will be adopted extensively by other makers. Like other new features which involve a somewhat radical change in design, the front-wheel drive is being watched with interest by Cord's competitors. They have concluded that the motorist's enthusiasm has been only mildly aroused and therefore this new development does not warrant the attention given to other innovations such as the four-wheel brake.

Orders for pulverized fuel equipment in September aggregated 37 mills as against 11 mills in August, according to reports received from the industry by the Department of Commerce.

Chain Belt Co., Milwaukee, has appointed the Alabama Machinery & Supply Co., Montgomery, Ala., and the Concrete Products Sales Co., Ltd., Oakland, Cal., as distributers of its construction equipment.

U. S. Steel Corpn. Appears in New Freight Rate Appeal

WASHINGTON, Dec. 2.—Continuance of rates on iron and steel in Official Classification territory and cast iron pipe and fittings in carloads from points in trunk line and Southern territories to destinations in Southern territory and also from producing points in Southern territories to points in the South without observing the long-and-short haul provisions of the fourth section of the Interstate Commerce Act is asked in briefs just filed with the Interstate Commerce Commission.

The briefs include one filed by the applicant carriers in Central Freight Association, Illinois Freight Association, Eastern Trunk Line and New England territories, and another filed by subsidiaries of the United States Steel Corpn. in the Pittsburgh district. These subsidiaries are the American Bridge Co., American Sheet & Tin Plate Co., American Steel & Wire Co., Carnegie Steel Co., and National Tube Co.

The rate adjustment involved is that which went into effect May 20, 1930, in connection with the general readjustment of rates on iron and steel products throughout Official Classification territory. The proposed adjustment centers particularly about grouping in the Pittsburgh district and was the object of extensive hearings.

Airway Equipment Orders Total $288,209

WASHINGTON, Dec. 2.—Eight contracts amounting to $288,209 for equipment for Federal airways have been awarded by the aeronautics branch of the Department of Commerce. Among them was one for $268,453 awarded to the Westinghouse Electric & Mfg. Co. for 30 visual-type beacon transmitters and accessories.

Steel Castings Producers Large Users of Scrap

Steel castings companies in the United States consumed approximately 1,783,900 gross tons of scrap iron and steel during 1929, to produce 1,583,040 tons of castings, it is reported by the Research Bureau of the Institute of Scrap Iron and Steel, New York. This estimate is based on actual returns received from companies representing 65 per cent of the total steel castings capacity of the country, the reporting companies having consumed a total of 1,159,550 tons of scrap in 1929. The total steel castings capacity is estimated at 2,097,995 tons, after eliminating plants which have long been idle. The report says:

"Although the total output of steel castings last year, as reported by the American Iron and Steel Institute, was only 1,583,040 tons, the general estimate of the trade is that the average of good castings is about 65 per cent of the total amount of steel melted. On this basis, it would have required a melting charge of about 2,435,000 tons of pig iron and scrap to make the 1,583,040 tons of castings. Defective castings and sprues, heads and gates account for the loss. This material is recharged as scrap and accounts almost wholly for the home scrap of steel castings plants.

"The total amount of scrap consumed by the steel castings industry is analyzed as follows:

	Scrap Consumed by Companies Reporting to Institute, Representing 65 Per Cent of Total Capacity, Tons	Estimated for Total Steel Castings Industry, Tons
Purchased in the open market	702,567	1,080,872
Home scrap	456,983	703,028
Total consumption of scrap	1,159,550	1,783,900

"An analysis of the scrap purchases of 40 steel castings companies, which purchased 270,498 tons of scrap in the open market, shows the following:

	Tons
Purchases from scrap iron dealers	245,612
Purchased direct from producers of scrap	24,886
Total	270,498

"The disposition of the above purchased scrap follows:

	Tons
Melted in acid open-hearth furnaces	148,183
Melted in electric furnaces	113,693
Melted in basic open-hearth furnaces	3,030
Unclassified	5,592
Total	270,498

"A factor that contributes to the large consumption of scrap by the steel castings industry is the growing production of electric steel castings, for which the scrap charge in most instances is about 100 per cent. The electric steel castings capacity of the country last year was 528,415 tons, or more than a quarter of the total of 2,097,995 tons, while the output of electric steel castings was 419,039 tons of a total castings production of 1,583,040 tons."

With the payment of dividends covering third quarter on Nov. 12, the United Engineering & Foundry Co., Pittsburgh, completed 29 years of continuous dividend payments on its securities outstanding in the hands of the public. Total payments to common stockholders during this period amounted to $19,330,000, while preferred stockholders have received $3,675,000. While annual payments on common stock have varied, stockholders have constantly received some distribution of profits each year. During 1930 common stock payments have amounted to $3 a share, as compared with $2.65 in 1929.

Heavier Imports of Pig Iron

Pig iron imports into the United States in October, 13,552 gross tons, made the largest total since last May and, with that exception, the greatest since last December. More than two-thirds of all came from British India and most of the remainder from Great Britain. This was in contrast with a year ago, when England sent very little and Canada sent more than one-fourth the total.

Imports in 10 months, 103,939 tons, were just about equal to nine months last year (103,594 tons) and fell short nearly 14,000 tons of the 1929 10-month total. Comparing 1930 with 1929 (10 months), receipts from India have increased 24,500 tons, while those from England were falling 19,757 tons and those from Netherlands were dropping 13,788 tons. Iron from Canada has almost disappeared, this year.

UNITED STATES IMPORTS OF PIG IRON BY COUNTRIES
(In Gross Tons)

	October		10 Months Ended October	
	1930	1929	1930	1929
United Kingdom	3,407	65	12,146	31,903
British India	9,256	8,846	77,601	53,117
Germany	....	....	50	103
Netherlands	100	207	6,041	19,929
Canada	74	3,809	562	7,281
France	....	....	....	101
Belgium	....	....	615	184
Norway	....	1,027	2,834	2,888
Sweden	685	281	3,292	1,721
All others	30	60	798	662
Total	13,552	14,295	103,939	117,889

Ohio River Steel Movement Gained in October

Movement of steel products on the Ohio River in the Pittsburgh district in October amounted to 138,109 net tons, according to the United States Engineer office at Pittsburgh. This represents a considerable increase over the 109,129 tons reported in the preceding month, as well as over the 119,129 tons shipped during October, 1929.

On the Monongahela River, steel shipments in October amounted to 105,451 tons, compared with 106,079 tons in the previous month and 119,380 tons in October, 1929. Steel shipments on the Allegheny River were 11,490 tons last month, compared with 5100 tons in the preceding month. There was no movement on the Allegheny in October, 1929.

Code for Welding and Cutting

The 1930 edition of Part A, Code I, for fusion welding and gas cutting in building construction, being published by the American Welding Society, 33 West Thirty-ninth Street, New York, features an appendix intended to obviate the necessity of consulting the publications of the American Bureau of Welding cited in the 1928 edition. The material is primarily a digest of the A.B.W. publication, with additional explanatory matter where needed to make it more applicable to code purposes. The 1930 edition is essentially the same as that of 1928 except for minor changes in the wording of three paragraphs in sections 3, 4 and 5 respectively. The chairman of the society's committee on building codes is F. T. Llewellyn, United States Steel Corpn., New York.

Sharp Drop in Orders for Malleable Castings

WASHINGTON, Nov. 29.—Orders for malleable castings in October totaled 23,848 net tons, compared with 26,228 tons in September, according to reports received by the Bureau of the Census from 117 firms operating 131 plants. That made the lowest total in several years.

Production was 28,641 tons, or 28.8 per cent of capacity, compared with 26,505 tons, or 27.2 per cent of capacity, in September, while shipments were 29,176 tons and 29,157 tons respectively.

Fabricated Plate Orders Lower in October

WASHINGTON, Dec. 2.—Bookings of fabricated steel plate in October totaled 24,002 net tons, against 33,602 tons in September, according to reports received by the Bureau of the Census from 48 fabricators.

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UNITY of purpose is the significant thought in the 1931 Carnegie Steel Co. safety trophy, shown in the illustration. The executive, the superintendent, and the workman declare themselves "all for safety." The figures are in bronze and were modeled from poses by men in Carnegie plants. The group stands before a cross-section of a rail which is flanked by two car wheels. These are done in silver, and the whole is mounted on a plinth formed of riveted beam sections done in bronze. On the sides of the beam sections will be placed the silver plates carrying the names of the winners. This is the tenth year there has been a trophy in competition among the Carnegie company's plants and each one is an artistic piece of bronze, or bronze and silver. The entire group was elaborately displayed during the National Safety Congress in October.

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▲▲▲ PERSONALS ▲▲▲

HENRY A. ROEMER, president of the Continental Steel Corpn., Kokomo, Ind., has been elected president of the Sharon Steel Hoop Co., Sharon, Pa., and will enter upon his new duties Jan. 1. He succeeds SEVERN P. KER, president of the company for the past 21 years, who, as announced in THE IRON AGE last week, has been elected chairman of the board, a newly created office. Mr. Ker will also remain as chairman of the executive committee, but Mr. Roemer's election will relieve him of many of the burdens of detail management which have increased with the growth of the company. Mr. Roemer was born at Struthers, Ohio, in 1884, and began his business career in the rolling mills at that place. Later he became superintendent of the Struthers plant of the American Sheet Steel Co., and in 1907 went with the Youngstown Sheet & Tube Co. as assistant superintendent. He became general superintendent of the Canton Sheet Steel Co., Canton, Ohio, in 1913, and later was appointed assistant general manager of that company. He was instrumental in the organization of the Superior Sheet Steel Co., Canton, in 1919, and served as president of that organization until 1927, when it was merged with the Chapman Price Steel Co., Indianapolis, and the Kokomo Steel & Wire Co., Kokomo, Ind., to form the Continental Steel Corpn. He has served as president of the Continental corporation since that time.

Henry A. Roemer

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HORACE J. ALLEN, formerly superintendent at the Cleveland plant of the Bourne-Fuller Co., has been made superintendent of the Mystic Iron Works, Everett, Mass., blast furnace. He succeeds H. J. BRINEY, who has resigned.

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HARRY F. SOPER, for several months vice-president and general manager of the Greenfield Tap & Die Corpn., Greenfield, Mass., has resigned. F. G. ECHOLS, president, will take over his duties.

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CHARLES MERKEL, until recently with the laboratories of the American Frigidaire Corpn., has joined the engineering department of the Edge Moor Iron Works, Wilmington, Del.

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DAN M. AVEY, editor of *Foundry*, will address the Chicago Foundrymen's Club, Dec. 4, at the City Club, on the subject of "Research and Researchers."

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WILLIAM HEPBURN, vice-president, Surface Combustion Co., Toledo, Ohio, addressed the New Jersey chapter of the American Society for Steel Treating on Dec. 2. His subject was "Furnaces and Fuels."

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ALFRED T. DUFFIELD, for some years identified with the office of W. J. FILBERT, controller of the United States Steel Corporation, New York, has been appointed assistant secretary of the Steel corporation.

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W. H. HIMES, formerly mechanical engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, has been made manager of the engineering department of the company's Nuttall works. Mr. Himes has been active for several years in the standardization work of the American Gear Manufacturers' Association, now serving as chairman of the worm gear committee.

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J. E. HART, for the past seven years general superintendent of the Walworth Co., Boston, has been made works manager of the Boston plant. He was formerly identified with the Well Point works of the Western Tube Co. and, when that company was taken over in 1917 by the Walworth organization, he became identified with the latter. In 1920 he took over the rating department of the Kewanee works and was later assistant supervisor of planning works. CHESTER L. ERICKSON, who has been associated with the company since 1924, has been made superintendent of production. Mr. Erickson went with the company in the capacity of time study engineer and later became assistant to the general superintendent. J. FRANK DORNEY, who first became connected with the company in the finishing departments of the wrench and tool division in 1923 and later engaged in time study work, has become assistant to the works manager.

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BERNARD B. PATTEN, formerly sales representative in New York and New England for the V & O Press Co., Hudson, N. Y., has been appointed western district sales manager, with offices at 543 West Washington Boulevard, Chicago.

Severn P. Ker

C. C. HANDLEY, of the Chain Belt Co., will speak on "Malleable Practice" at a meeting of the Quad-City Foundrymen's Association to be held at the Fort Armstrong Hotel, Rock Island, Ill., Dec. 15.

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H. D. WILKINSON has been elected vice-president of Liquid Metal Products, Inc., Chicago. He has been engaged in sales promotion work for this company for several years.

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T. R. SWENSON, formerly of the Danly Machine Specialties Co., Chicago, has joined the sales department of the Midwestern Tool Co., Chicago.

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CHESTER T. DIKE, for 31 years in the service of the Chicago & North Western Railroad, has been appointed chief engineer, succeeding the late Walter James Towne. For 10 years prior to 1919, Mr. Dike was general superintendent of lines in Minnesota and the Dakotas and in 1919, when the railroads were under Federal control, he was made assistant general manager of lines west of the Missouri River. In 1920 he became engineer of maintenance, which position he held until his recent promotion to chief engineer.

OBITUARY

W. R. BALSINGER, assistant to the president of the Carnegie Steel Co., Pittsburgh, died on Nov. 27 at his home in that city after more than a half century's association with the Carnegie company. He was born in Pittsburgh 64 years ago, and was first employed at the Edgar Thomson works of the Carnegie company in 1879. Later he was transferred to Homestead works as ordnance engineer in charge of Government work. He had been assistant to the president for a number of years.

W. R. Balsinger

CHARLES R. HEDDEN, founder and president of the C. R. Hedden Construction Co., New York, died at his home in Newark, N. J., on Nov. 30, of the effects of a stroke of apoplexy suffered a week ago. He was graduated from Stevens Institute and, after a brief period in his father's employ, he started his own business. He was 77 years old.

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GEORGE R. ELDER, formerly vice-president of Ingersoll-Rand Co., New York, died at his home at Waterford, N. Y., Nov. 29, aged 68 years. Mr. Elder received his technical education at the Troy Polytechnic Institute and later became associated with A. J. Moxam in the Johnson Co., now the Lorain Steel Co., Johnstown, Pa. He subsequently joined the Ingersoll Sergeant Drill Co., Easton, Pa.

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A. B. NEWMANN, Chicago consulting engineer who laid out the city of Gary, Ind., and who was instrumental in the design of the steel mills there, died Nov. 28 at Düsseldorf, Germany. Mr. Newmann was born in Norway and went to Chicago in 1898. He recently had finished work on rebuilding steel mills at Manchester, England. Since July he had been a member of the group of steel mill engineers that the Freyn Engineering Co. has sent to Moscow in connection with the design and construction of steel works at Kuznetsk, Siberia. Mr. Newmann was 60 years old.

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HENRY ZIEMANN, founder and president, Empire Level Mfg. Co., Milwaukee, died suddenly on Nov. 26 of a heart attack. He was 68 years old and widely known in the tool and hardware trade.

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ISAAC W. FRANK, chairman of the board of the United Engineering & Foundry Co., Pittsburgh, and, prior to his partial retirement some time ago, one of the most active men in the Pittsburgh districts steel industry, died at his home in the Hotel Schenley, Pittsburgh, on Dec. 1. He was born in Pittsburgh on Dec. 2, 1855, and attended Newell Institute and the Western University of Pennsylvania before taking up engineering study at the Rensselaer Polytechnic Institute at Troy, N. Y., from which he was graduated in 1876.

He began his business career with the Keystone Bridge Co. at Pittsburgh, at that time engaged in the building of the New York elevated railway. Following several years of activity in the railroad and bridge building field, Mr. Frank turned his attention to the manufacture of rolls and rolling mill machinery, and served as secretary of the Lewis Foundry & Machine Co., Coraopolis, Pa. In 1892 he helped to organize the Frank-Kneeland Machine Co., and later was instrumental in the formation of the United Engineering & Foundry Co. Mr. Frank had served as president of the United company until October, 1919, when he resigned to become chairman of the board.

His closest direct connection with the steel industry was in the old American Sheet Steel Co., now a part of the American Sheet & Tin Plate Co., he having helped to organize the former company. He was also active in the coal industry, and was one of the organizers of the National Founders' Association, later serving as its president. At the time of his death Mr. Frank was a director in the following companies identified with the metals industry: National Steel Corpn., Pittsburgh; Damascus Bronze Co., Pittsburgh; Apollo Steel Co., Apollo, Pa.; Copperweld Steel Co., Glassport, Pa., and the Great Lakes Engineering Works, Detroit. In recent years he had been very active in philanthropic work, and had served as an officer and director of many organizations devoted to such activity.

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JAMES G. DORNBIRER, who founded the Cleveland Planer Works, Cleveland, in 1897, died Nov. 27, aged 63

I. W. Frank

years. He was the designer of the line of open-side planers built in the plant he established. He retired from the Cleveland Planer Works in 1918 and at the time of his death was president of the Dornbirer Machine Tool Co., manufacturer of gasoline pumps and other automobile service equipment. He was a member of the Cleveland Engineering Society and of the American Society of Mechanical Engineers.

Steel Plate Fabricators Form Institute

Fabricators of steel plates have formed an organization to be known as the Institute of Steel Plate Construction, and temporary offices have been established at Room 1107 at 33 West Forty-second Street, New York, in charge of J. W. Poushey, secretary. The purpose of the institute is to deal with all questions affecting the industry, including the development of efficiency and economy, compilation of trade information, establishment of trade standards and promotion of new uses for plates.

The following directors have been elected: A. Caverno, Lancaster Iron Works, Lancaster, Pa.; William S. Wheeler, Pennsylvania Engineering Co., New Castle, Pa.; B. P. McDaniel, McClintic-Marshall Co., Pittsburgh; George R. McAleenan, McAleenan Brothers Co., Pittsburgh; George T. Horton, Chicago Bridge & Iron Works, Chicago; S. E. Fairchild, Jr., Cruse-Kemper Co., Ambler, Pa.; A. M. Duncan, Cole & Duncan, Long Island City, N. Y.; J. A. Connelly, Petroleum Iron Works Co., Sharon, Pa.; W. R. Guest, Birmingham Tank Co., Verona, Pa.

A merger of the Philadelphia and Reading chapters of the Institute of Scrap Iron and Steel has been completed.

Machine Tool Buying Postponed to New Year

Small Volume of Business Being Done and December Outlook Is Not Promising

AS the final month of each year is usually a time of restricted purchases of shop equipment, the machine tool trade has no expectation that there will be any developments this month to break the extreme dullness that has existed during the latter half of 1930.

Every seller of metal-working tools has a fairly large list of prospective purchases, most of which have been pending for some time, but in nearly all instances those who have inquired for tools have postponed action to the new year, and even then, perhaps, they will await evidence of general business improvement.

Outstanding purchases for these times were made last week by the Lycoming Mfg. Co., Williamsport, Pa., and the American Car & Foundry Co., New York. The former placed orders for about $20,000 worth of new equipment for work on automobile engines, and the latter bought four or five machines. A Detroit manufacturer of automotive parts ordered eight lathes.

Operating schedules in machine tool plants are very much restricted. A good many shops shut down for three or four days during Thanksgiving week.

New York

Although in general the machine tool trade has shown no improvement, the week has been featured by two orders of unusual size for these times. The Lycoming Mfg. Co., Williamsport, Pa., has placed orders for about $20,000 worth of machine tool equipment in preparation for production of automobile engines on a larger scale. The American Car & Foundry Co., New York, placed orders for four or five machines.

Machine tool dealers see little prospect of any further business of importance until after the first of the year at the earliest, and the trend at that time will depend to a great extent on signs of general business improvement. Negotiations that have been in progress for the purchase of tools have in most cases been suspended, the common excuse being that no purchases will be made before the new year.

Chicago

November bookings of machine tools declined from the October volume, and, if inquiries can be taken as a gage, the December total may drop still lower. Fresh inquiries are small and fewer than a week ago, and sales are near the low point of the year. Orders for work reaching jobbing shops are spotty and appear to be lighter than at mid-November.

New England

Scattered sales of tools, including two tool room lathes to the city of Boston for the new Brighton district school, were reported the past week. A slight increase in metal-working shop activity has raised hopes among dealers that a buying movement will set in early in January. Interest in the used tool market centered in the auction sale of the E. A. Eddy Machinery Co., Inc., Providence, on Tuesday. Equipment included presses, rolling mills, jointers, lathes, planers, grinders, upright drills, swaging machines, vertical boring mills and other tools.

Cincinnati

With users of machine tools continuing their policy of retrenchment, the machine tool market in this district is quiet. A few orders have dribbled in the past week for one or two machines, but there has not been sufficient new business to warrant any change in operations or to indicate a revival of buyers' interest. In fact, inquiries the past week have declined. The holiday last week gave manufacturers an opportunity to close down for four days. A manufacturer of electrical devices purchased two 11-in. lathes the past week.

Milwaukee

While demand for machine tools remains relatively inactive, and prospects for December appear only slightly better than the October-November period, the fact that business in the metal trades generally is improving is accepted as a good sign. Payrolls not only are holding their own, but instances of men being recalled by various plants are more frequent. Confidence is expressed that the passing of the holidays and inventory periods will witness a revival of machine tool trade. In fact, current inquiry, in many instances, hints that purchases will be made at that time, contingent, of course, upon business improvement.

Pittsburgh

With business this month generally expected to be light, machine tool dealers in this district are concentrating attention on early 1931 prospects. Evidence of a definite revival in buying is lacking thus far, but heavy prospective equipment purchases by the railroads, as well as a continuance of steel plant expansion and improvement programs, are hopeful signs. However, a large part of the optimism for next year has arisen from a belief that the business depression has reached its turning point and that the machinery trade will share in the general recovery.

Current machine tool trade is dull. Dealers are preparing bids on the Norfolk & Western list, which incidentally contains a rather small percentage of machine tools, even though a large number of other items are included. The Pennsylvania is negotiating for a few tools, but nothing has come out recently. Otherwise, railroad buying is negligible. Activity among industrial plants is still confined largely to estimating for 1931 budgets. The Westinghouse Electric & Mfg. Co., East Pittsburgh, has come into the market for a few tools. Plans of the larger steel companies are rather indefinite, although a large volume of work is said to be under consideration.

Cleveland

A slight spurt in activity developed the past week in which three large lathes, a turret lathe and two standard production lathes were sold by one dealer. In Detroit a manufacturer of automotive parts purchased eight lathes, the business going to a Cleveland dealer. Little new inquiry is coming out. The volume of business in November showed very little change as compared with October. Employment reports show that operations by metal-working plants in Cleveland gained slightly in November over October.

New York

CONTRACT has been awarded by Attica Film Corpn., 1501 Broadway, New York, to Turner Construction Co., Graybar Building, for six-story motion picture film manufacturing plant, 150 x 200 ft., at 521 West Forty-third Street, to cost $550,000 with equipment. Ely J. Kahn, 2 Park Avenue, is architect.

Espey Mfg. Co., 58 Warren Street, New York, manufacturer of radio equipment and parts, has leased floor in building at 141 Wooster Street for expansion.

H. E. Salzberg Co., Inc., 225 Broadway, New York, electric machinery and equipment, has taken bids for a one-story storage and distributing plant at Jersey City, N. J., to cost about $25,000 with equipment. William Neumann, 25 Journal Square, Jersey City, is architect.

Board of Education, Park Avenue and Fifty-ninth Street, New York, has authorized plans for a multi-story industrial and vocational high school for boys at Sixty-fifth Street and Eighth Avenue, Brooklyn, to cost about $1,660,000 with equipment. Walter C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect.

Shampan & Shampan, 188 Montague Street, Brooklyn, architects, have plans for a multi-story automobile service, repair and garage building, to cost over $200,000 with equipment.

Department of Correction, Municipal Building, New York, Richard C. Patterson, Jr., commissioner, will build a power plant at new penitentiary on Riker's Island, for which bids have been asked on general contract, entire project to cost about $10,000,000.

New York State Electric & Gas Corpn., Albany, will build an addition to electric power plant at Ghent, N. Y., and install additional equipment. Authority has also been secured to acquire power plant and system of Treadwell Light & Power Co., Franklin, N. Y., and consolidate with properties in that district. Company recently arranged for a bond issue of $6,700,000, portion of fund to be used for expansion and improvements.

Kennedy-Van Saun Mfg. & Engineering Corpn., 2 Park Avenue, New York, manufacturer of mining, crushing, pulverizing machinery, etc., has secured site at Fayetteville, Tenn., and contemplates branch plant, to cost over $50,000 with equipment.

Frederick H. Klie, 250 Park Avenue, New York, architect, has plans for an automobile service, repair and garage building, to cost close to $100,000 with equipment.

Plant of Mathewson lead division of National Lead Co., 111 Broadway, New York, at Long Island City, totaling 100,000 sq. ft., has been leased by Forest Box & Lumber Co., Inc., 420 Oakland Street, Greenpoint, Brooklyn, for new plant. Forest company is considering new unit on site to cost over $40,000 with equipment. Shell Eastern Petroleum Products, Inc., 122 East Forty-second Street, New York, recently purchased present Forest company property for a new oil storage and distributing plant.

Gatti Paper Stock Corpn., Thirteenth and Monroe Streets, Hoboken, N. J., has awarded general contract to Auf Der Heide Contracting Co., 443 Sixteenth Street, West New York, N. J., for a two-story addition, 90 x 192 ft., to cost over $65,000 with equipment. C. F. Dieffenbach, 84 Washington Street, Hoboken, is architect.

New Jersey Bell Telephone Co., Telephone Building, Newark, has purchased property at Fabyan Place and Loretta Avenue for a new six-story equipment storage and distributing plant, 103 x 260 ft., with one-story service, repair and garage building adjoining, 123 x 220 ft., to cost more than $600,000 with equipment. New plant will replace present unit at Morris Avenue and Bruce Street.

United Tool & Die Works, Inc., Newark, N. J., care of Skellington, Walker & Corrigan, 18 East Park Street, attorneys, recently formed by Frederick P. Bollinger, 339 Ridge Street, and associates, contemplates operation of local plant for manufacture of tools, dies and kindred specialties.

Board of Education, 31 Green Street, Newark, N. J., will receive bids until Dec. 10 for metal-working and woodworking machinery, air compressors, electrical supplies, steel cabinets, lockers and other equipment as per list on file. R. D. Argue is secretary.

Harry G. Bach, 63 Schureman Street, New Brunswick, N. J., architect, has plans for a one-story automobile service, repair and garage building, 63 x 200 ft., to cost about $100,000 with equipment.

New England

BOARD of Education, New Canaan, Conn., plans installation of manual training equipment in new two-story high school to cost about $280,000. J. N. Pierson & Son, 198 Jefferson Street, Perth Amboy, N. J., are architects.

Public Service Co. of New Hampshire, 1087 Elm Street, Manchester, N. H., has completed arrangements for purchase of

INDUSTRIAL ACTIVITY

Prospects Revealed by a Survey of Construction Projects

THE total of new construction requiring machinery and other equipment is $21,750,000 for the past week, a decline from $38,000,000 a week ago, but a slight improvement from the total of $18,000,000 two weeks ago. In addition there is more than $35,500,000 in bond and note issues by public utilities.

Of this week's total, construction by metal-working plants is about $750,000, municipal projects about $1,000,000, oil company expansion in excess of $700,000 and public utility projects more than $9,000,000.

Airport construction is a feature of the week's construction totaling $2,275,000, including a $75,000 bond issue for completing the Indianapolis airport, $1,000,000 for an air field and aircraft factory at Kankakee, Ill., and $100,000 each for airport expansion projects at Alameda, Cal., and Little Rock, Ark.

The paper industry is represented in the week's projects with a $5,000,000 hydroelectric plant at Juneau, Alaska, which will provide power for a $10,000,000 paper mill to be constructed nearby, a $1,000,000 coated paper plant at Hamilton, Ohio, and $75,000 paper products plants at Norwood, Ohio, and Rumford, Me.

Certain of the larger industrial projects of the week are included in plans for next year, such as $2,000,000 in improvements at Detroit and other plants of the United States Rubber Co., $1,500,000 for a sugar beet mill at Denver, and $3,000,000 for a plate glass plant at Santa Ana, Cal., for the Pittsburgh Plate Glass Co.

Public utility expansion includes $1,500,000 to be expended for equipment and transmission lines on the Ozark dam by the Empire District Electric Co., $1,500,000 for a hydroelectric plant on the Tellico River in Tennessee, $500,000 for a transmission line from Roanoke Rapids to Richmond, Va., and $500,000 for improvements at Santa Cruz, Cal., by the Coast Counties Gas & Electric Co. Among the larger municipal projects are a $200,000 power plant at Vanita, Okla., and $500,000 for a dam and improvements to the local water supply at Cumberland, Md.

Vocational school construction totaling about $3,000,000 includes schools at Minneapolis, Chicago, Washington, Battle Creek and Flint, Mich.; Ola, Ark.; San Antonio, Tex., and Oakland, Cal.

Bethlehem Electric Co., Bethlehem; Lisbon Light & Power Co., Lisbon; Freedom Electric Co., and Campton Electric Co., Campton, N. H., and will consolidate with other properties. Plans are under way for expansion in districts noted, including transmission lines.

Mount Waldo Granite Co., Mount Waldo, near Frankfort, Me., has plans for a one-story stone-cutting, finishing and polishing plant, 50 x 250 ft., to cost about $60,000 with equipment. Mechanical-handling equipment will be installed. Leo F. Caproni & Co., 1044 Chapel Street, New Haven, Conn., are architects and engineers.

Leon M. Ludden, 6 Morse Avenue, Worcester, Mass., and associates have organized Snow-King Mfg. Co., with capital of $25,000, to operate a local plant for production of snow plows, snow-removal machinery, parts, etc. Mr. Ludden will be treasurer; Frank Clarkson, Worcester, is president.

Edward J. Lamothe Co., 25 Chestnut Street, Somerville, Mass., manufacturer of galvanized ware, etc., has plans by Miller & Levi, 46 Cornhill Street, Boston, architects, for one-story plant, 100 x 140 ft., at Malden, Mass., to cost close to $50,000 with equipment.

Manchester Gas Co., Manchester, N. H., will issue notes aggregating $4,000,000, part of fund to be used for extensions and improvements in gas plant and system.

Interests connected with Hoffman Specialty Co., Waterbury, Conn., have organized Hoffman Specialty Co. of California, Ltd., as an affiliated company, to take over electric heater manufacturing branch of business. Headquarters will be in Architects' Building, Los Angeles, and plant will be operated at San Francisco. Waterbury works will continue manufacture of steam heating equipment and specialties. George D. Hoffman is president of new company, and Potter Bowles, treasurer.

City of Danbury, Conn., has preliminary plans for a trade school.

Oxford Paper Co., Rumford, Me., has plans for an addition, to cost $75,000 with equipment.

Frank L. Thayer, 120 Central Street, Athol, Mass., engineer, is building a two-story machine shop, 40 x 60 ft.

Standard Water Co., Stamford, Conn., has awarded a general contract for a one-story 21 x 37-ft. pumping station for which electrical equipment will be purchased.

Buffalo

CONSTRUCTION of a new dock on Onondaga Lake has been authorized by Solvay Process Co., Solvay, Syracuse, N. Y., a subsidiary of Allied Chemical & Dye Corpn., New York, to be 300 ft. long, with hoisting, conveying and other equipment for handling raw materials, to cost $200,000. Work will be carried out in connection with general expansion and improvement program now under way, for which an appropriation of $5,000,000 was recently approved.

E. J. Miller, 106 West Green Street, Ithaca, N. Y., and associates have organized E. J. Miller & Co., Inc., to operate a local plant for production of gasoline engines and parts.

W. E. Mathis Vinegar Co., Albion, N. Y., plans rebuilding part of plant, consisting of six three-story buildings, recently destroyed by fire, with loss over $300,000 including vats, generators and other machinery.

Alco Products, Inc., recently organized by officials of American Locomotive Co., 30 Church Street, New York, will take over plant of parent company at Dunkirk, N. Y., including foundry, forge shop, plate shop, pipe and machine shops, and other structures, for manufacture of processing equipment for oil refineries, including stills, condensers, coolers, etc. Company will absorb Heat Transfer Products, Inc., Dunkirk, a subsidiary, specializing in mechanical heating equipment. W. H. Woodin, chairman of board of American Locomotive Co., will be chairman of executive committee of new company; Joseph Davis will be president, and J. O. Hobby, Jr., treasurer.

Philadelphia

CONTRACT has been let by Philadelphia Gas Works Co., 1401 Arch Street, Philadelphia, to Fred A. Havens Co., 845 North Nineteenth Street, for a one-story mechanical shop, to cost about $35,000 with equipment. Company engineering department is in charge.

Gulf Refining Co., Girard Point, Philadelphia, has plans for a one-story addition to local refinery, for a mechanical control unit, to cost over $30,000 with equipment.

Gillette Rubber Co., Eau Claire, Wis., manufacturer of automobile tires, tubes, etc., has leased part of building at 2104-12 Washington Avenue, Philadelphia, for a new factory branch, storage and distributing plant.

Risser & Rabinowitz, Inc., Delaware Avenue and Mifflin Street, Philadelphia, meat products, plan installation of refrigerating equipment, mechanical-handling equipment and other machinery in new six-story storage and distributing plant, 75 x 100 ft., to cost about $125,000.

Warren-Webb, Inc., Philadelphia, has been organized with capital of $25,000 to take over company of same name, with headquarters at 3427 Chestnut Street, new interest to specialize in manufacture of parts, assembling, etc., of automobiles. William H. Warren-Webb is president; Nelson J. Tarbottom is treasurer.

Central Plumbing Supply Co., Twelfth and Spring Garden Streets, Philadelphia, has acquired property, 184 x 500 ft., at Sixth and Clearfield Streets, and is considering expansion for storage and distributing service.

William H. Stough, 933 North Duke Street, York, Pa., and associates have organized Norway Mfg. Co., with capital of $100,000, to operate a local plant for manufacture of electrical and mechanical appliances and equipment, including brass and aluminum castings, etc. Mr. Stough will be treasurer. E. A. Fowler, York, will be an official of new company.

State Purchasing Agent, State House, Trenton, N. J., will receive bids until Dec. 8 for steel automobile tag blanks and automobile tag materials, as per specifications on file.

Trenton Potteries Co., Trenton, N. J., manufacturer of sanitary ware, affiliated with Crane Co., Chicago, has awarded general contract to S. W. Mather & Son, 300 Maple Avenue, for a one-story addition, 40 x 200 ft., to cost about $50,000 with equipment. Lockwood Greene Engineers, Inc., 100 East Forty-second Street, New York, is architect and engineer.

Alexander Vardaro Fireworks Mfg. Co., Overbrook, Pa., recently organized by Alexander Vardaro, Overbrook, and associates, has acquired about 100 acres at Bear, Del., for a new plant, about 16 acres to be used for initial work.

Jacob Auslander, 1238 Point Breeze Avenue, Philadelphia, has leased part of industrial building on Washington Avenue for expansion in storage and distributing service, pipe fitting, etc.

Jacobs Stone Products Corpn., York, Pa., recently chartered by G. Oscar Jacobs, 462 West Market Street, and associates, plans operation of limestone quarries, with mining, crushing, storage, distributing, loading and other equipment.

South Atlantic

TOWN COUNCIL, Frostburg, Md., is planning extensions in municipal waterworks, to cost about $100,000 with pipe lines and equipment, and will arrange bond issue soon. William A. Gunter is city engineer.

Virginia Electric & Power Co., Richmond, Va., is planning extensions in steel tower transmission lines, including new line from power station at Roanoke Rapids to Richmond, Petersburg and vicinity, to cost close to $500,000. Stone & Webster Engineering Corpn., Boston, is engineer.

Southern King Refractories, Inc., 489 Stephens Street, S. W., Atlanta, Ga., recently organized, has acquired local property and will establish a plant for manufacture of high-temperature refractory products, operating under process of King Refractories Co., Inc., 1715 Niagara Street, Buffalo.

Veterans' Bureau, Washington, will receive bids until Dec. 16 for steel water tank and tower for service at Perry Point, Md.

Sinclair Refining Co., 45 Nassau Street, New York, has arranged for purchase of Koon Oil Co., operating at Asheville and other parts of western section of North Carolina, with storage and distributing plant at Asheville. Purchasing company will carry out expansion program, including new storage and distributing plant on site soon to be acquired, to cost over $100,000 with equipment.

Caroline Foundry Co., 723 South Caroline Street, Baltimore, manufacturer of semi-steel and gray iron castings, has awarded general contract to DeCou & Chidlaw, Biddle and Eutaw Streets, for three-story foundry, to cost close to $50,000 with equipment. W. S. Austin, Maryland Trust Building, is consulting engineer.

City Council, Cumberland, Md., is planning fund of $500,000 for extensions in water supply system, including construction of dam, 68 ft. high, pipe line installations, etc. City engineering department will be in charge.

Southern Industries & Utilities, Inc., care of Robert H. McNeill, National Press Building, Washington, has applied for permission to construct a hydroelectric power development on Tennessee River, near Aurora Landing, Tenn., to cost over $500,000.

Bureau of Yards and Docks, Navy Department, Washington, will receive bids until Dec. 26 for a mine-filling plant at naval ammunition depot, Hawthorne, Nev., including 12 buildings, standard gage railroad line, etc.

Board of District Commissioners, District Building, Washington, is planning installation of manual training equipment in new Theodore Roosevelt High School to cost over $1,400,000, for which general

contract has been let to National Construction Co., Tower Building. A. L. Harris, District Building, is municipal architect.

Natural Bridge of Virginia, Inc., Natural Bridge, Va., plans extensions and improvements in power plant, including installation of an oil-engine generator set and auxiliary equipment. An ice-manufacturing plant is also being considered. John Temple is director, in charge.

Chicago

CONTRACT has been let by Oakland Foundry & Machine Co., Belleville, Ill., to Bader Brothers Construction Co., 424 Lebanon Street, for new one-story foundry, 225 x 325 ft., to replace a unit recently destroyed by fire, to cost over $125,000 with equipment.

Illinois Power & Light Corpn., 231 South La Salle Street, Chicago, has arranged for a bond issue of $8,500,000, part of fund to be used for expansion and improvements in electric light and power properties, including transmission lines.

Board of Education, Minneapolis, has voted to build a new junior high school at University Avenue and Broadway, N. E., and plans installation of manual training equipment. A fund of $400,000 will be provided. Work will begin in 1931. Bureau of Buildings, Division of Design and Inspection, 811 Broadway, N. E., is architect and engineer.

General Minnesota Utilities Co., Pine City, Minn., has plans for a steam-operated electric power station at McGregor, Minn., to cost over $90,000 with equipment. F. E. Halden, Kasota Building, Minneapolis, is architect; R. B. Fanning, last-noted address, is consulting engineer.

American Beet Sugar Co., Steel Building, Denver, is contemplating a new sugar refinery near Winnipeg, Man., to cost about $1,500,000 with equipment. Project will include a machine shop and power house. Company engineering department will be in charge.

Republic Aircraft Corpn., 822 West Seventieth Street, Chicago, contemplates beginning work early in January on new airplane manufacturing plant near Kankakee, Ill., where a large tract has been acquired, to include units for parts production and assembling. An airport, with hangar, repair and reconditioning facilities will be built at same location. Entire project will cost over $1,000,000. R. Levine & Co., address noted, are company architects.

Northern States Power Co., Minneapolis, has arranged for a note issue of $10,000,000, part of proceeds to be used for extensions and improvements in plants and system.

Waukegan Generating Co., Waukegan, Ill., operating electric light and power properties, has arranged for an increase in capital from $5,000,000 to $7,500,000, part of fund to be used for expansion.

Veterans' Bureau, Construction Division, Washington, is asking bids until Dec. 23 for coal-handling equipment for institution at North Chicago, as per specifications on file.

St. Louis

WORK is under way by Empire District Electric Co., Springfield, Mo., on an expansion and improvements to cost about $1,500,000, including additional machinery at Ozark dam power plant, new transmission lines with power substation facilities from Powerside to Aurora, and from Springfield to Sedalia. Company is a subsidiary of Cities Service Co., 60 Wall Street, New York. Engineering department is in charge.

City Council, Vinita, Okla., has plans for a municipal electric light and power plant, to cost over $200,000 with transmission system. Russell & Axon, 6200 Easton Avenue, St. Louis, are engineers.

Ola Special School District, Ola, Ark., is considering installation of manual training equipment in new two-story high school to cost about $125,000. C. M. Hirst, State House, Little Rock, Ark., is architect.

Shirley D Mining Co., Stotts City, Mo., will develop local mining property, and plans installation of a crushing plant, mechanical-handling equipment, etc., to cost about $60,000. Fred A. Carmody, Atlasta Place, Joplin, Mo., is one of heads of company.

Continental Oil Co., Continental Oil Building, Denver, is planning pipe line from Tonkawa to vicinity of Oklahoma City, Okla., with connection to line extending to Ponca City, Okla., for crude oil supply for refinery at that place, about 81 miles, to cost close to $500,000. E. H. Skinner is manager of company pipe line department.

Common Council, Nowata, Okla., has plans for a municipal electric light and power plant, to cost close to $100,000 with equipment.

Municipal Airport Commission, Little Rock, Ark., is arranging for enlargements in municipal airport, including purchase of additional land, erection of hangars, repair shop and other field units, to cost over $100,000. E. E. Stansberry is city engineer.

Board of Education, Oklahoma City, Okla., plans installation of manual training equipment in new three-story Taft junior high school, 170 x 375 ft., to cost about $250,000, for which general contract has been awarded to William Lambert Construction Co., 416 North Walker Street. Layton, Hicks & Forsythe, Cotton-Grain Exchange Building, are architects.

Detroit

WORK will soon begin by Metallic Casket Co., Springfield, Ohio, for new factory branch, storage and distributing plant at Detroit, to cost close to $40,000 with equipment. H. Jerome Darling, First National Bank Building, Detroit, is architect.

Board of Education, Flint, Mich., is considering installation of manual training equipment in new two and three-story and basement school to cost about $300,000, for which revised plans are being drawn by Malcolmson, Higginbotham & Trout, 1217 Griswold Street, Detroit, architects.

Chevrolet Motor Co., 3044 West Grand Boulevard, Detroit, has leased a building at Richmond, Va., for a new assembling plant for truck bodies.

United States Rubber Co., 6600 East Jefferson Avenue, Detroit, manufacturer of automobile tires and tubes, is considering expansion and improvements at local plant in 1931, including erection of several new units. Company expended about $5,000,000 on modernization of Detroit and other plants during past year, and projected work will cost over $2,000,000 with equipment. Company is controlled by E. I. duPont deNemours & Co., Wilmington, Del. J. F. O'Shaughnessy is general manager of Detroit works.

Dee-Wite, Inc., 1016 Book Building, Detroit, recently organized, will take over and expand company heretofore known as Dee-Wite Boats, with boat-building and repair plant at River Rouge. Incorporators of new company include Harold H. Bowman and Joseph B. Lodge.

Durocher Co., Detour, Mich., manufacturer of mechanical specialties, has authorized one-story machine shop to replace unit recently destroyed by fire, to cost about $25,000 with equipment.

Lenert Aircraft Co., Pentwater, is considering removal of plant to Three Oaks, Mich., where expansion will be carried out. Project will include a parts and assembling plant, repair shop and landing field. Business interests at new location are raising a fund to insure establishment of plant.

Board of Education, Battle Creek, Mich., plans installation of manual training equipment in first unit of new junior high school, for which a fund of $175,000 is being arranged. Board has authorized immediate employment of architect to prepare plans.

Detroit Brass & Malleable Works, 1177 Holden Street, Detroit, has arranged for an increase in capital from $1,650,000 to $2,350,000 for general expansion.

Cincinnati

EXPANSION program is being arranged at mills of Champion Coated Paper Co., Hamilton, Ohio, to cost close to $1,000,000 including equipment. Company is considering extensions and improvements at branch plant at Canton, N. C., operated under name of Champion Fibre Co. A new mill is contemplated near Mobile, Ala., for production of book and coated papers, and uncoated stocks, with installation of four paper-making machines and auxiliary equipment, to cost over $1,500,000.

Board of directors, St. Xavier University, Cincinnati, has plans for a manual training school unit, to cost about $350,000 with equipment.

West Virginia Coal & Coke Co., Atlas Bank Building, Cincinnati, has awarded a general contract to Fisher-DeVore Construction Co., Dana Street and Idlewild Avenue, for new coal storage and distributing plant, to include installation of coal-handling machinery, screens, etc., to cost over $60,000.

Contracting Officer, Wright Field, Dayton, Ohio, is asking bids until Dec. 10 for quantity of streamline tie rods; until Dec. 8 for quantity of propeller hub assemblies and propeller sleeve assemblies, and until Dec. 16 for 189 propeller blades.

Mountain Power Co., Tellico Plains, Tenn., C. P. Hereford, head, has applied for permission to construct a hydroelectric power plant on Tellico River, tributary of Little Tennessee River, with a series of power stations, to cost over $1,500,000 with power dams and transmission system.

Chatfield & Woods Co., 227 West Third Street, Cincinnati, manufacturer of paper products, has awarded a general contract to Leibold-Farrell Co., Schmidt Building, for new one and two-story plant at Norwood, to cost more than $75,000 with equipment. John H. Deekin, 15 East Eighth Street, Cincinnati, is architect.

Cleveland

PLANS are being arranged by Direct Action Stove Co., Lorain, Ohio, a division of American Stove Co., 825 Chouteau Avenue, St. Louis, for expansion early next year, including new units for punch press shop and enameling works, each to cost over $200,000 with equipment. J. R. Haley is superintendent.

Whitacre-Greer Fireproofing Co., Waynesburg, Ohio, manufacturer of hollow tile and other fireproofing materials, is planning to rebuild part of local plant recently damaged by fire, with loss over $35,000 including equipment.

City Council, Norwalk, Ohio, will soon begin extensions and improvements in municipal electric light and power plant, with installation of additional equipment. Frochlich & Emery Engineering Co., Second National Bank Building, Toledo, Ohio, is engineer.

Willard Metallic Crypt Co., Willard, Ohio, care of J. W. McCarron, Guarantee Title Building, Cleveland, recently organized with capital of $25,000, plans operation of factory at Willard for manufacture of metallic caskets, etc. J. Roy Thomas, Willard, is one of heads of company.

United States Standard Mfg. Co., Columbiana, Ohio, manufacturer of concrete mixing machinery, concrete block-making equipment, etc., has awarded a general contract to R. W. Heck, East Palestine, Ohio, for one-story addition, 60 x 100 ft., to cost about $30,000 with equipment.

Officials of Byers Machine Co., Ravenna, Ohio, manufacturer of steam shovels, cranes and kindred heavy machinery, have organized Byers Excavator Co., as a subsidiary, to manufacture and distribute excavating machinery. Incorporators include J. C. Little and R. M. Egan.

Milwaukee

LARGE investment in presses and dies is being made by Gurney Refrigerator Co., Fond du Lac, Wis., preparatory to entrance into field of complete mechanical refrigerators. Until now company has manufactured steel cabinets and steel and wood ice-cooled refrigerators. Three sizes of household refrigerators will be regularly produced. Enameling ovens of plant also are being remodeled to make possible use of a new imitation porcelain finish on steel cabinets.

Oshkosh Motor Truck, Inc., has been incorporated to take over operations of Oshkosh Motor Truck Mfg. Co., Oshkosh, Wis., in receivership past year. Production is being resumed with initial force of 60.

F. Rassmann Mfg. Co., Beaver Dam, Wis., manufacturer of farm and dairy barn equipment, has started work on reconstruction of main foundry, 42 x 146 ft., damaged by fire recently. New facilities are expected to be ready late this month.

Angers Machine Co., South Milwaukee, manufacturer of automotive parts and specialties, is adding a galvanizing shop and will enter field of manufacturing transmission line towers and similar products.

Board of Vocational Education, Manitowoc, Wis., has voted to issue $200,000 in bonds for construction and equipment of a new manual training and domestic science institute.

Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis., is taking figures on two 5000 gal. per min. pumping units for new $40,000 pumping plant at its paper mill at Stevens Point, Wis.

Milwaukee Board of School Directors has placed contracts for a service building, 76 x 93 ft., two stories, costing $75,000. Frank M. Harbach is business manager.

Eau Claire Airways, Eau Claire, Wis., has plans by A. W. Bayer, local architect, for steel and concrete hangar and service shop, 60 x 100 ft., at State Street field. John C. Simpson is general manager.

Board of Vocational Education, Racine, Wis., has placed contracts for $40,000 shop addition to Center Street vocational training school, to be ready about Feb. 1.

Common Council, Superior, Wis., has authorized plans for new municipal garage and service shop, 75 x 140 ft., one story, to cost $40,000 with initial equipment. M. G. Beckley is city clerk.

Gulf States

PLANS are under way by Continental Wirebound Box Co., Maury Avenue and Campbell Street, Houston, Tex., for a one-story addition, to cost about $21,000 with equipment.

McDorgan-Phillips Packing Corpn., Mobile, Ala., will soon take bids for a one-story food products canning plant at Columbia, Miss., 85 x 250 ft., to cost over $85,000 with machinery. A. J. Kressler is construction engineer in charge.

United Gas Corpn., Fort Worth, Tex., has purchased group of natural gas pipe lines of Southern Natural Gas Co., extending from point near Jackson, Miss., to Mobile, Ala., and Pensacola, Fla., including branch lines to Bogalusa, La., Hattiesburg, Gulfport and Biloxi, Miss. New properties will be operated by United Pipe Line Co., a subsidiary, which plans extensions to connect system with present main pipe lines at different centers.

Biloxi Grit Co., East Beach Street, Biloxi, Miss., plans erection of a two-story oyster shell crushing plant, 30 x 120 ft., to replace factory recently destroyed by fire, installation to include electric-operated equipment, screens, transmission equipment, etc., to cost close to $40,000.

Texas & Pacific Northern Railway Co., Dallas, Tex., operated by Texas & Pacific Railway Co., same address, plans expenditure of over $200,000 for engine house, machine and repair shops in connection with construction of new 300-mile line, entire project to cost over $2,000,000. E. F. Mitchell, Dallas, is chief engineer.

Board of Education, San Antonio, Tex., is planning installation of manual training equipment in new junior high school in Woodlawn district, to cost over $500,000. A special election has been called on Dec. 18 to vote bonds for structure. Phelps & Dewees, Gunter Building, are architects.

City Council, Port Arthur, Tex., contemplates a municipal airport and seaplane base, including hangars, repair shop, oil storage and other field units. City engineering department will be in charge.

Louisiana Power & Light Co., New Orleans, has plans for a one-story equipment storage and distributing plant, to cost over $30,000 with equipment.

Mississippi Public Service Co., Laurel, Miss., a subsidiary of Peoples Light & Power Corpn., 27 William Street, New York, has arranged for purchase of pipe lines and other natural gas distributing properties of Southern Cities Public Service Co., and Mississippi Natural Gas Co., including lines to Meridian, Columbus and other points in State. New owner plans extensions and improvements in pipe lines, compressor stations, etc., in different districts.

Frozen Juice, Inc., A. C. Terwilliger, 418 Washington Avenue, Titusville, Fla., head, plans installation of freezing machinery, mechanical-handling and other equipment in new plant for production of orange juice under a special process, to cost about $50,000 with equipment.

Air Corps, United States Army, Washington, is asking bids on general contract until Dec. 18 for four standard airplane hangars at Maxwell Field, Montgomery, Ala., with repair and reconditioning facilities.

Economy Street Marker Co., Littlefield Building, Austin, Tex., manufacturer of metal street signs, etc., is planning installation of die casting machines for production of small aluminum alloy castings.

Indiana

BOND issue of $14,000,000 is being sold by Northern Indiana Public Service Co., Hammond, considerable part of fund to be used for extensions and improvements in plants and system, including completion of new steam-operated electric generating station at Michigan City, extensions in transmission lines from new plant and other districts, power substations, etc. expansion will also be carried out in gas properties. Company engineering department in charge.

Power Reproducers, Inc., Michigan City, recently organized with capital of $35,000, plans operation of local factory for manufacture of electrical machinery and parts, with assembling facilities. Company is headed by Victor T. Part and Albert W. Spiers, both of Michigan City.

Board of Trustees, Indiana State Farm for Feeble-Minded, Butlerville, will soon begin erection of one-story and basement power house, 84 x 84 ft., in connection with other expansion. Orlando B. Little, 307 North Illinois Street, Indianapolis, is architect.

City Council, Indianapolis, is arranging a bond issue of $75,000 for completion of municipal airport, including hangar and other field units. City engineering department is in charge.

Advance-Rumely Co., La Porte, manufacturer of agricultural implements and machinery, has taken over plant and business of Indiana Farm Machinery Corpn., same place. Latter name will be discontinued and acquired company will operate under Advance-Rumely name. Consolidated company will have capital of $10,000,000 preferred stock, and 500,000 shares of common stock, no par value.

Pittsburgh

GENERAL contract has been let by Jones & Laughlin Steel Corpn., Pittsburgh, to M. J. Boyle & Co., 105 West Monroe Street, Chicago, for one-story storage and distributing plant, 102 x 494 ft., at Chicago, to cost close to $175,000 with equipment. Maher & McGrew, Evanston, Ill., are architects.

H. M. Cramblet, secretary, Board of Public Education, Administration Building, Pittsburgh, will receive bids until Dec. 16 for stokers, boilers, temperature regulation equipment, unit heaters, etc., for Arsenal high school, as per specifications on file.

Duquesne Light Co., 435 Sixth Avenue, Pittsburgh, has purchased 63,337 sq. ft. at Homewood, for expansion in power substation and switching plant, work to begin early in spring. Company engineering department is in charge.

Premier Engineering Co., Erie, Pa., care of Gunnison, Fish, Gifford & Chapin, Erie, attorneys, recently organized, is planning establishment of local plant for manufacture of wood-working and metal-working machinery and parts. R. W. Bauer and E. P. Poole, Erie, are heads.

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, has engaged Stone & Webster, Inc., Laughlin Building, Los Angeles, engineer and contractor, to make soil tests and surveys for a new sheet glass manufacturing plant on 80-acre tract at Santa Ana, Cal., with machine shop, power house and other structures, to cost over $3,000,000 with machinery. Titan Metal Mfg. Co., manufacturer of brass and bronze rods, shapes, forgings and automatic machine screw parts, Bellefonte, Pa., is erecting an addition, 60 x 200 ft. Contracts for equipment have been placed and operations are expected to begin about March 1.

Pacific Coast

AN appropriation of about $500,000 is being arranged by Coast Counties Gas & Electric Co., Russ Building, San Francisco, for extensions and improvements in plant and system at Santa Cruz, Cal., and vicinity, including installation of additional equipment. Company engineering department is in charge.

Los Angeles Brick Co., 1078 Mission Road, Los Angeles, contemplates extensions and improvements in Alberhill plant at Hermit, Cal., including installation of additional equipment, to cost close to $100,000.

Hammer Bray Co., Twenty-sixth Avenue and East Twelfth Street, Oakland, Cal., manufacturer of gas stoves and parts, has asked bids on general contract for new one-story plant, to cost over $175,000 with machinery. Clay N. Burrell, American Bank Building, is architect; W. W. Hanscom is company engineer.

Liquid Sugar Corpn., Stockton, Cal., an interest of the International Sugar Co., has purchased local mill of Sperry Flour Co., and will remodel for new plant for sugar production, to cost over $100,000.

Orange County Refining Co., Newport Beach, Cal., is planning extensions and betterments in oil refinery at West Newport, including installation of new still and auxiliary equipment, to cost over $45,000.

Washington Gas & Electric Co., Tacoma, Wash., has arranged for bond issue of $3,000,000, part of proceeds to be used for extensions and improvements in plants and system.

Alameda Bay Airdrome, Webster Street, Alameda, Cal., R. U. St. John, field manager, has plans for new one-story all-steel hangar and administration building, 120 x 440 ft., with mechanical shop and reconditioning facilities, to cost close to $100,000 including equipment.

George T. Cameron, publisher of *San Francisco Chronicle*, Fifth and Mission Streets, San Francisco, and Harry Chandler, publisher of *Los Angeles Times*, Los Angeles, have secured permission to erect a hydroelectric power plant on Long, Crater and Dorothy Lakes, near Juneau, Alaska. Plant will have capacity of 80,000 hp., and will cost close to $5,000,000. Project will include erection of pulp and paper mill in same vicinity, to cost about $10,000,000 with machinery.

Board of Education, Oakland, Cal., plans erection of vocational shop at proposed new school group on Fremont high school site, to cost about $400,000, and for which bids will be asked on general contract in December. Charles W. McCall, 1404 Franklin Street, is architect.

Sunset Pacific Oil Co., Klamath Falls, Ore., contemplates new oil storage and distributing plant, to cost close to $40,000 with equipment. Lee Provo is manager.

Canada

PLANS are being prepared by C. C. Stenhouse, architect, for a one-story factory at Oshawa, Ont., for Coulter Mfg. Co., a subsidiary of Coulter Copper & Brass Co., Ltd., 115 Sumach Street, Toronto.

Canada Cement Co., Ltd., Pale Street, Port Colborne, Ont., will erect a plant in Humberstone township to cost $500,000, construction to start next spring.

Dominion Oilcloth & Linoleum Co., Ltd., 2200 St. Catharine Street East, Montreal, has awarded general contract to Church, Ross Co., Ltd., 1440 St. Catharine Street, for a two-story brick plant addition to cost $50,000.

Several contracts have been awarded for new plant of Canada Wire & Cable Co., Ltd., 940 Inspector Street, Montreal, one story, 100 x 650 ft., to cost $175,000.

City of Ottawa contemplates erection of workshops and garage to cost $200,000. A. F. Macallum, City Hall, is commissioner of works.

Bids are being received by S. H. Kent, city clerk, Hamilton, Ont., for a three-story addition to machine shop, to cost $50,000.

Town Council, Rockland, Ont., contemplates purchase of present waterworks plant and will make improvements and install new equipment at cost of $40,000. C. W. A. Marion is clerk.

Improvements will be made to waterworks plant at St. Cesaire, Que., including installation of centrifugal 600-gal. pump, gasoline engine, electric motor, pumping equipment, etc. R. Dassault is secretary-treasurer.

Foreign

PLANS are under way by Southern Railway Co., Ltd., Southampton, England, for new docks, including hoisting, conveying and other mechanical handling equipment; project will include drydock, 1200 ft. long, 135 ft. wide, and 45 ft. deep, with repair shops and facilities for giant ocean liners. Entire program will cost $50,000,000 and will be carried out with Government assistance.

Polsko-Belgijske Zaklady Chemiczne, S. A. (Polish-Belgian Chemical Co.), Brussels, Belgium, has purchased about 148 acres at city of Torun for new plant for production of sulphuric acid, superphosphates and kindred products, to cost over $150,000. Company is affiliated with Union Chimique Belge, Brussels.

Tokyo Electric Co., Tokyo, Japan, affiliated with International General Electric Co., 120 Broadway, New York, is planning erection of new plant at Dairen, South Manchuria, for production of electric lamps, to cost 3,000,000 yen (about $1,500,000) with machinery. South Manchuria Electric Co., Mukden, Manchuria, is interested in project.

South African Steel & Iron Industrial Corpn., Ltd., 82 Marshall Street, Johannesburg, South Africa, has plans for a new rolling mill and molten metal shop, at Pretoria works, to cost over $250,000 with equipment.

Astra Romana Co., Bucharest, Rumania, is planning to rebuild part of oil refinery, including gasoline division, recently destroyed by fire with loss close to $200,000, including machinery.

New Trade Publications

Material-Handling Equipment.—Louden Machinery Co., Fairfield, Iowa. Book of 64 pages, profusely illustrated, which pictures many interesting installations of conveying equipment, analyzes the problems of material handling and discusses the selection of correct methods and equipment. Overhead monorail equipment is featured.

Pipeline Painter.—Sullivan Machinery Co., 400 North Michigan Avenue, Chicago. Bulletin 83-Y on Sullivan GV pipeline painter for oil and gas lines.

Non-Metallic Gears and Blanks.—General Electric Co., Schenectady, N. Y. Bulletins GEA-1043A of 11 pages, and GEA-818A of 15 pages deal with non-metallic gears and blanks and fabroil gears. Price lists and tables of specifications are given.

Industrial Heating Devices.—General Electric Co., Schenectady, N. Y. Circular describing and illustrating a variety of heating devices, such as soldering irons, glue pots, helicoil immersion heaters, strip heaters, cartridge units, air-drawing ovens, metal-melting pots and cast-in immersion units, direct-heat furnaces, etc.

Conveyor Chains.—Link-Belt Co., 200 South Belmont Avenue, Indianapolis. 32-page data book devoted to Promal chains, a new product for use on power transmission and conveying equipment.

Rustless Steel.—Samuel Osborn & Co., Ltd., Sheffield, England. Five eight to 16-page pamphlets describing the applications and method of handling the company's rustless steel, rustless plastic iron, fireproof steel and other corrosion-resistant steels.

Ingot Iron.—American Rolling Mill Co., Middletown, Ohio. A 12-page pamphlet illustrating and describing the use of corrugated, galvanized ingot iron sheets in the coal industry. Uses include facing on coal tipples, for mine cars, as roofing on miners' dwellings, in mine overcasts and for gutters and flashing.

Liftruck.—Revolvator Co., 336-352 Garfield Avenue, Jersey City. Bulletin 92-J illustrates and describes the Red Giant lift truck for use in material handling, which is furnished in platform sizes ranging from 18 in. x 30 in. to 26½ x 72 in.

Gas Storage Tanks.—Stacey Brothers Gas Construction Co., Cincinnati. Bulletin 32, illustrating the Stacey "bullet" tank for high-pressure gas storage, said to be adaptable to any space, fitting into narrow lanes between buildings, yet permitting additional sections to be added at low cost.

Railroad Equipment

Milwaukee Road Inquires for 57 Locomotives

THE Milwaukee Road has come into the market for 57 locomotives, which, added to the 50 inquired for by the New York Central a week ago, gives the locomotive builders more work to bid on than they have had before them in some time. Both of these roads also may come into the market for several thousand freight cars each, but no immediate request for prices is expected. The Illinois Central may revive an inquiry for 2200 cars. Items of the week follow:

Milwaukee Road is inquiring for 40 freight and 17 passenger locomotives.

Chicago & Illinois Midland has ordered two locomotives from Lima Locomotive Works.

Lehigh Valley is inquiring for 100 70-ton gondola cars.

Reading Railroad has ordered 10 heavy locomotives from Baldwin Locomotive Works.

Coking Coal Consumption 25 Per Cent Below Year Ago

WASHINGTON, Dec. 2.—Consumption of coking coal at by-product plants in October amounted to 4,991,805 net tons, according to the Bureau of Mines. In comparison with the 6,658,006 tons consumed in the corresponding month of last year, this is a decrease of 1,666,201 tons, or 25 per cent. With the exception of New England, where a gain of 4½ per cent took place, each of the consuming regions shows a lower rate of consumption.

Less Iron Ore Imported in October

Imports of iron ore in October, 186,396 gross tons, were, as usual, mostly from Chile. There was a drop (from September) of 13½ per cent in the total and a decline from October, 1929, of 31 per cent. In spite of this considerable reduction, however, the imports for 10 months have held within 2½ per cent of 1929, and form the third largest on record.

Comparing 1930 with 1929 (10 months), receipts from Cuba are down 64 per cent and those from Sweden, 32 per cent. French Africa has shown a gain of 54 per cent and Chile, one of 14½ per cent, representing a much heavier tonnage. Spain, on a much smaller tonnage, showed a 51 per cent gain.

SOURCES OF AMERICAN IMPORTS OF IRON ORE
(In Gross Tons)

	October		10 Months Ended October	
	1930	1929	1930	1929
Chile	132,875	153,283	1,540,450	1,351,836
Cuba	....	46,000	190,654	532,350
Spain	6,700	4,626	74,078	48,885
Sweden	7,205	35,914	187,116	274,744
French Africa	8,000	....	218,375	141,795
Canada	39	40	395	3,443
Other countries	31,577	30,416	313,137	231,350
Total	186,396	270,279	2,524,205	2,584,403

TRADE NOTES

Everding Chemical Co., 270 Lafayette Street, New York, has been appointed Eastern distributer for the Graham-Shively Corpn., Binghamton, N. Y., and will carry a stock of the company's products for rust removal and prevention, preservation of brake linings and other industrial uses.

* * *

"Electromet" is the title of an elaborate pamphlet of nearly 50 pages, issued as the third edition, by the Electro Metallurgical Sales Corpn., a unit of the Union Carbide & Carbon Co., 30 East Forty-second Street, New York. There is an introduction discussing the service which the company gives its customers, followed by a detailed description including analyses of its many products, some of which are chromium, manganese, silicon, vanadium and zirconium as ferroalloys and other combinations.

* * *

The Franklin Institute, Philadelphia, in accordance with its practice established about five years ago, will this year again present a series of lectures for young people to be given on the James Mapes Dodge Lecture Foundation. Dr. E. E. Free of New York will be the lecturer and his topic will be "The Scientific Work of Benjamin Franklin." He will give three lectures at 3 p. m. on Dec. 29, 30 and 31.

* * *

A report of the research committee on fatigue of metals of the American Society for Testing Materials has been published. Its 52 pages present an excellent summary of the status of fatigue testing, which has been prepared by Prof. H. F. Moore, University of Illinois, Urbana, Ill., chairman of the committee.

* * *

Union Wire Die Corpn., 333 West Fifty-second Street, New York, has renewed its contract with the Friedrich Krupp Co., Germany, for the manufacture of dies of Widia metal for drawing purposes. Morris Simons, president, Union Wire Die Corpn., states that machinery for the manufacture of these tools has been ordered and that negotiations for manufacturing space are under way.

* * *

In a news item regarding the acquisition of the stock and good will of the sheet metal division of the Richards Co., Boston, by Joseph T. Ryerson & Son, Inc., in THE IRON AGE of Nov. 27, p. 1660, it was mentioned that in 1926 the Ryerson company entered the Boston territory through the purchase of the Penn Metal Co. The Ryerson company desires to correct this statement as it purchased only the reinforcing bar division of the Penn company.

* * *

Pennsylvania Engineering Works, New Castle, Pa., is making final shipment to the National Tube Co. at McKeesport, Pa., of equipment for a large duplexing steel plant which consists of three 25-ton converters, two 800-ton mixers and three 250-ton tilting open-hearth furnaces.

Cleveland Iron and Steel Market

(*Concluded from page* 1719)

at $13 for heavy melting steel and $12 for No. 1 busheling. However, Valley prices are now weaker, $12.25 to $12.75 being ruling quotations on No. 1 heavy melting steel. Cleveland mills have good stocks and have not resumed taking shipments. Local prices are unchanged on heavy melting steel scrap, but compressed steel, light stampings, No. 2 busheling, and some other minor grades are lower.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$10.75 to $11.25
No. 2 heavy melting steel	10.00 to 10.50
Compressed sheet steel	10.00 to 10.50
Light bundled sheet stampings	8.50 to 9.00
Drop forge flashings	9.75 to 10.00
Machine shop turnings	5.00 to 5.50
Short shoveling turnings	7.75 to 8.00
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	10.00 to 10.50
No. 1 busheling	9.50 to 10.00
Pipes and flues	6.50 to 7.00
Steel axle turnings	9.50 to 10.00
Acid Open-Hearth Grades:	
Low phos., billet bloom and slab crops	16.50 to 17.00
Blast Furnace Grades:	
Cast iron borings	7.25 to 7.50
Mixed borings and short turnings	7.25 to 7.50
No. 2 busheling	6.75 to 7.00
Cupola Grades:	
No. 1 cast	13.00 to 13.50
Railroad grate bars	10.00 to 10.50
Stove plate	10.50 to 11.00
Rails under 3 ft	16.00 to 16.50
Miscellaneous:	
Rails for rolling	16.25 to 16.50
Railroad malleable	12.50 to 13.00

Erratum

In the Old Timers' Section of the 75th Anniversary Number of THE IRON AGE, published on Nov. 20, the address of the Wilson Welder & Metals Co., Inc., was given as New York instead of North Bergen, N. J.

British Steel Man Criticizes Proposed Self-Contained Steel Plant

(*By Cable*)

LONDON, ENGLAND, Dec. 1.

VISCOUNT FURNESS at the annual meeting of the South Durham Steel & Iron Co. said that this country could never meet "dumping" competition from countries where wages are 50 per cent lower even though reorganization might take place, with or without Government aid, and he added that if, according to the policy of free trade advocates, competitive products are to be made here, British wages must be reduced 50 per cent.

He criticized the American plan for an English self-contained plant with an annual output of 3,000,000 tons of steel as showing what little knowledge our critics possess of British raw material supplies, manufacturing conditions and markets, adding that such a plan would necessitate absorption of the raw materials of all producers in any district where the plant might be erected, and it would be necessary to find further sources of supplies.

Referring to conversations with Dorman, Long & Co., Viscount Furness intimated that he considered under present conditions that no advantage could be gained from so-called rationalization, which would involve further large capital expenditure.

The Australian Senate has rejected, on its second reading, the iron and steel bounties bill.

The South Manchurian Railway Co.'s Anshan and Laioyang furnaces are reported to have sold about 300 tons of pig iron to Czechoslovakia. Additional reports of pig iron sales to the United Kingdom are denied.

Czechoslovakia buys pig iron from South Manchuria furnaces.

* * *

Australian Senate rejects bill granting bounties on iron and steel.

* * *

South African steel plant at Pretoria will be completed in 1932 with annual steel output of 160,000 tons.

* * *

Expiration of 58 German wage agreements, Jan. 1, affects 761,000 men.

A national coal strike has been averted by temporary district agreements, but the Scottish miners are out and even if a settlement is reached no resumption is possible before next Tuesday.

The general iron and steel situation is unaltered. Mills are badly in need of orders, especially from shipyards, and part-time operation is prevalent.

Continental steel buying here is slow, as consumers are well stocked and the end of the year is approaching, but prices are generally higher as European works are reported to have booked substantial overseas orders, especially from China and Japan based on a reduction in ocean freights, and other overseas merchants have covered their requirements.

Tin plate is quiet except for several moderate sized export inquiries, one of which has matured for first quarter shipment. Conference and non-member mills are reported to be negotiating satisfactorily for an output restriction agreement, and a further meeting will be held in Swansea on Dec. 2.

Clyde output in November was nine vessels of 21,000 tons. Workman, Clark & Co. are closing their Belfast shipyard for a period not exceeding two months from Dec. 20.

The British Southern Railway plans to construct a new giant dock at Southampton to accommodate the new Cunard liner. The dock will be 1200 ft. long and 135 ft. wide at the entrance.

Early Continental Recovery Foreseen

(*By Radio*)

BERLIN, GERMANY, Dec. 1,

EXPORT activity in iron and steel products, which began to improve in November, is continuing, particularly with South American and Scandinavian markets.

Prices for export are relatively firm, ranging from four to six marks a ton higher than in November. The price for steel bars, f.o.b., Antwerp,

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at $4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Ferromanganese, export	£11	5s.	to	£11	10s.	$54.75	to	$55.95
Billets, open-hearth	5	12½	to	6	5	27.34	to	30.41
Black sheets, Japanese specifications	12	5				59.61		
Tin plate, per base box	0	16	to	0	16¼	3.89	to	3.95
						Cents a Lb.		
Steel bars, open-hearth	7	15	to	8	5	1.69	to	1.79
Beams, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Channels, open-hearth	7	12½	to	8	12½	1.66	to	1.87
Angles, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Black sheets, No. 24 gage	9	0	to	9	5	1.95	to	2.01
Galvanized sheets, No. 24 gage	11	5				2.44		

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£2	11s.	to	£2	12s.	$12.40	to	$12.65
Billets, Thomas (nominal)	£3	14½s.	to	£3	15s.	$18.12	to	$18.24
Wire rods, low C., No. 5 B.W.G.	5	2½	to	5	7½	24.94	to	26.15
Rails, light	6	0				29.20		
Black sheets, No. 31 gage, Japanese	11	5	to	12	12	54.68	to	58.32
						Cents a Lb.		
Steel bars, merchant	4	7½	to	4	10	0.93	to	0.97
Beams, Thomas, British standard (nominal)	3	19	to	4	0	0.86	to	0.87
Channels, Thomas, American sections	5	12	to	5	14	1.24	to	1.26
Angles, Thomas, 4-in. and larger, over ⅜-in. thick	3	18	to	3	19	0.85	to	0.86
Angles, Thomas, 3-in.	4	3	to	4	4	0.88	to	0.89
Hoop and strip steel over 6-in. base	4	12	to	4	12½	0.99	to	1.00
Wire, plain, No. 8 gage	3	15	to	3	17½	0.84	to	0.85
Wire, barbed, 4-pt. No. 12 B.W.G.	9	12½				2.09		
Wire nails, base	5	15				$1.26 a keg		

has been advanced 10 m. ($2.38) per ton. Mills expect further recovery of Continental markets.

Pig iron and steel output have increased slightly and certain steel works in the West report an increase in the volume of orders. Domestic demand continues limited and prices are unchanged for December.

South African Steel Plant Ready in 1932

HAMBURG, GERMANY, Nov. 17.—The new plant at Pretoria of the South African Iron & Steel Industrial Corpn. is expected to be ready for operation early in 1932, with an initial capacity of 160,000 tons of steel a year, about 35 per cent of the total steel requirements of the Union of South Africa. Eventually the capacity of the plant is to be increased to 250,000 tons annually. The blast furnaces are to have a capacity of 500 tons a day.

Construction of this new plant, which will have a substantial capacity for rails, will curtail the business of the International Rail Makers' Association in South Africa. The association members have been supplying about 70,000 tons of rails annually to South African railroads. The first unit of the new steel plant will employ about 1700, of whom between 200 and 300 will be European technical men and foremen under a technical staff of British and Germans.

Germany First in Exports of Ship Chains

HAMBURG, GERMANY, Nov. 17.—In the first half of this year, Germany moved into first place as an exporter of ship chains, shipping an average of 450 tons a month to foreign shipyards in the United Kingdom, Holland, Norway and Sweden, with small quantities to the United States.

Canadian Steel Output Turned Up in October

Production of pig iron in Canada in October totaled 40,079 gross tons. This was the fifth consecutive month in which a new low for the year was reported, the tonnage for October having been 17 per cent under the 48,395 tons produced in September. The decline was mostly in basic iron, which dropped to 26,922 tons from 35,044 tons, and in malleable, which fell to 2219 tons from 11,360 tons in the previous month. Foundry pig iron advanced to 10,938 tons from 1991 tons in September.

For the 10 months ended Oct. 31, pig iron production amounted to 661,795 tons, compared with 921,096 tons and 838,659 tons during the corresponding periods of 1929 and 1928 respectively.

Output of ferroalloys, at 5174 tons in October, was 72 per cent over the 3012 tons of the previous month. For the year to Oct. 31, the output totaled 59,877 tons, compared with 72,649 tons during the first 10 months of 1929 and 35,541 tons during the corresponding period of 1928.

The output of steel ingots and castings for October totaled 65,431 tons. This exceeded by 17 per cent the year's low of 55,808 tons reported for September and marked the first upturn in the seven months since the record for this year was established in March at 117,487 tons.

For the first 10 months of the year, production of steel ingots and castings totaled 876,282 tons, against 1,203,625 tons and 1,028,697 tons made during the corresponding 10 months of 1928 and 1929 respectively.

Wages in Germany Steadily Reduced

DÜSSELDORF, GERMANY, Nov. 15.—Wages in most German industries, including metallurgical plants, have been reduced about 2½ per cent in the past few months. By Jan. 1 further reductions in the wage level are expected to bring the total to about 8 per cent. Foundries and other plants in northern Germany have reduced wages 5 to 6 per cent, and on Jan. 1 some 58 wage agreements, affecting a total of 761,000 workmen, will expire in various non-ferrous, iron, steel and machinery-building plants. The reductions in the wage level are being made on the basis of declines in the retail price index for bread, vegetables, shoes and other commodities, totaling 10 to 20 per cent since last year.

Italians to Build Soviet Ball-Bearing Plant

WASHINGTON, Dec. 2.—A completely modern ball-bearing plant will be built in Moscow for the Soviet Government by one of the largest ball-bearing companies in Italy, according to a report to the Department of Commerce from Turin. It will be designed to double the present capacity. The contract provides for training the necessary technicians at the Turin plant, where, it is understood, a number of Soviet technicians are now at work.

Enameled Flat Ware Orders Gain Slightly

Orders for sanitary enameled flat ware placed in September were valued at $754,533, against $743,695 in previous month, and $1,012,815 in September of last year, according to reports received from the industry by the Bureau of the Census. Signs furnished $218,639 of the October orders; table tops, $122,434; stove parts, $116,833.

Germany Increasing Small Plane Output

HAMBURG, GERMANY, Nov. 17.—Construction of light, low-powered airplanes is developing rapidly in the German aircraft industry. Three manufacturers are now selling light two-place machines for sports and travel at $835 to $1,000, German, British and French certificates of airworthiness being provided with each plane. The machines are equipped with specially designed, low-fuel consumption motors.

Industrial Accidents Cost Five Billions a Year

Costs of industrial accidents in the United States annually are estimated by the United States Department of Labor at about $5,000,000,000. This estimate is based on the assumption that the indirect cost is four times as great as the compensation and medical payment. This includes costs of the State, the employer and the injured person, and is entirely aside from other losses.

Lost-time injuries each year are estimated at about 3,000,000, of which 25,000 are fatalities. In addition there are 87,000,000 minor injuries.

Structural Shapes and Concrete Bars

Manufacture of heavy structural shapes for sale in 1929 is reported by the United States Census Bureau at 3,650,043 gross tons, compared with 2,809,375 tons in 1927. This represents an increase of 30 per cent, which is somewhat higher than the increase for total production of heavy shapes, owing to the fact that there was a smaller proportion of the output used in the producing plants.

Total production is given as 3,999,434 tons, a gain of nearly 29 per cent over the 3,103,981 tons in 1927. The quantity consumed in the works where the material was produced was 141,075 tons in 1929, and the amount transferred to other plants of the same company was 208,316 tons.

Concrete reinforcing bars were made in 1929 to the extent of 864,326 gross tons. Of this amount 787,169 tons was for sale. Only 822 tons was used in the works and 76,335 tons was transferred to other plants of the producing company. These figures compare with 782,774 tons made in 1927, of which 103 tons was consumed in the works and the remainder (not split up as in 1929) was either transferred to other plants of the same company or was made for sale.

John D. Stanton Steel Co., warehouse distributer of sheets and strip steel, Detroit, has moved its offices to 925 Lafayette Building, that city.

Quality Control and Alloy Contamination in Making Open-Hearth Steel

(*Continued from page* 1701)

the tonnage basis and as an average plant by plant, where each plant is considered equivalent to each other plant, regardless of size.

There was considerable variation from plant to plant because of the differing characteristics of scrap used by these plants. This difference in scrap was brought about in large measure by the different geographical locations of the plants. These are scattered all over the country east of the Rocky Mountains, but a plea was made for a more representative list in some districts—notably around St. Louis and in the far West.

Much Variation from Plant to Plant

Residual manganese was found to vary from 0.08 per cent in one plant to more than 0.40 per cent in two other plants. Chromium showed a minimum of 0.003 per cent in the early part of the period in one plant, with nothing at all in the same plant later on, and went as high as 0.127 per cent in one plant in the March-June portion of the period. Vanadium varied from nothing in the early part of the period and a maximum of 0.003 per cent in that portion to as high as 0.015 per cent later on in one plant and as much as 0.010 in seven of the 19 plants.

Nickel as distributed among the plants varied from nothing to 0.090 per cent in the early period and in the later period from nothing to 0.128 per cent (average of two plants). Copper varied from 0.039 per cent to 0.219 per cent in the early months and from 0.036 per cent to 0.227 per cent later on. About half the plants reported no tin contamination. For the remainder, however, this element varied from 0.003 to as much as 0.041 per cent.

Silicate Inclusions in Steel

A PROGRESS report on the Bureau of Mines experiments was presented by Dr. Herty, following up similar reports made each half-year for several years. Between 20 and 25 heats of steel have been studied since the spring meeting, varying from 0.12 to between 0.50 and 0.60 per cent in carbon. These steels were of different characteristics, covering forging, axle, nut and other types of steel.

It was pretty well determined by the experiments that the manganese-silicon alloy used in recarburizing should have between four and seven parts of manganese to each part of silicon. Best results were found when this ratio was about 5 or 5½ to 1. In acid steel practice an alloy containing 30 per cent manganese and 5½ per cent silicon was found to give the best results, and results which were considerably better than obtained through the use of the ordinary ferromanganese.

This special alloy for basic use is really a high-silicon spiegeleisen, containing about 21 per cent manganese and 4 per cent silicon. In heats to be finished low in carbon this has to be watched pretty closely, because the carbon in this alloy is slightly higher than the silicon and will add to the carbon in the finished steel.

Found It Best to Have Heat Good and Hot

Dr. Herty recommended holding the heat in the ladle for 10 or 15 min. where possible. He said that all these experimental heats were held at least 5 min. He reported that it was found best to have the steel good and hot, even though this might be accompanied by a little more oxidation.

Inclusions extracted from the center of a billet from a cold-metal heat were shown on the screen, in different forms. There was a manganese silicate having about 60 per cent silicon, 35 per cent manganese and 5 per cent FeO, drawn from a 4-in. billet rolled from an ingot 19 in. x 21 in.

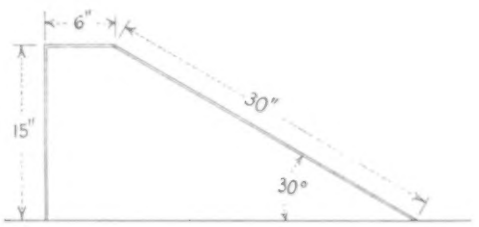
Some of the slides showing silicates found in steel castings were particularly interesting, as they contained small globules of the silicates in different forms, some being orange in color, others white, and some were like a transparent glass. When the samples were filtered through a 300-mesh screen many tiny particles not showing in the larger screened samples were found to give all the colors of the rainbow.

The larger particles had given a composition of about 35 per cent SiO_2, 55 per cent MnO and 10 per cent FeO. These showed a tendency to get out of the bath in a hurry. This was quite at variance with the smaller particles, whose composition was found to be about 60 per cent SiO_2, 35 per cent MnO and 5 per cent FeO. This latter corresponds with a viscous condition and the particles will not coalesce easily. It takes a long time to get them out of the bath.

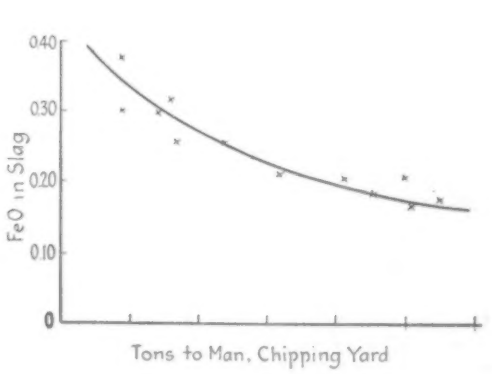
Why Ferromanganese Should Go Into the Furnace

From this study Dr. Herty concluded that ferromanganese should be added in the furnace before tapping, to get rid of these small particles by extracting them from the steel and producing, by reaction with them, the larger particles, which are easier to handle. In this way one can get the cleanest and soundest steel so far found obtainable, and can then deoxidize as much as necessary in the usual way.

A diagram placed on the blackboard by Dr. Herty, in which percentage of FeO in the slag was played up against chipping production, or tons of output of each man chipping, is shown herewith. With a steel of 0.09 per cent carbon best results were found obtained at about 22 per cent FeO in the slag, the best range being perhaps from 18 to 24 per cent.



SIMPLE device (left) for measuring the viscosity of slag. The thickness of a sample running down the slope tells the story.



LESS chipping is required on steel with 18 to 22 per cent of iron oxide in the slag than with higher oxide content (right).

Responsibility for Bad Steel

AN operating man whose practice requires the use of a large number of molds with a great variety of sizes and cross-sections made a vigorous defense of the open-hearth department in connection with the frequent steel mill charge of open-hearth responsibility for all kinds of bad steel made in the plant. He stated among other things that it is perfectly possible to heat and roll 28 ingots, from a single steel heat, in 28 different ways. But the open-hearth man cannot make the steel in 28 different ways in the same ladle.

He reported conditions wherein 80, 85 or 90 per cent of the ingots in a heat gave thoroughly satisfactory results in the finished steel, and said that the remaining ingots which became rejections cannot fairly be attributed to the open-hearth department, as so frequently is done. He believes that the heating and rolling of the steel is probably responsible for the defects in the small percentage which do not pass inspection.

Many Causes Exist for Poor Steel

As a partial answer to this contention one of the operating men, who is responsible for both open-hearth and Bessemer production, and also for the steel through the blooming mill into the billet form, stated that heating and rolling of the steel may not necessarily be the cause of such defects as the previous speaker mentioned. Some of the molds into which a heat is poured may not have a good surface. The steel pourer may take more precautions on some of the ingots than on others, and thus cause a poor surface through splashing against the walls of the mold.

In heating ingots in the soaking pits he reported his practice as an effort to damper the pits enough to avoid an oxidizing flame, during the period when the ingots are being brought up slowly to a uniform temperature throughout, with the aid of the much higher interior temperature compared with the skin. Then a reducing flame is used after the ingot has reached uniformity.

Another operating man who is responsible for both ends of the steel—rolling, as well as steel-making—expressed the view that the steel can be spoiled at any point along the line of its progress, from raw materials to shipping dock. But, a bad heat of steel cannot be made good either through excellent control in the heating or in the rolling process.

Viscosity Test for Slag

A test for viscosity of slag which Dr. Herty is using at the Bureau of Mines, Pittsburgh, in studying slag conditions was briefly described by him. He has taken a piece of steel strip about 6 in. wide and 51 in. long and rather less than ¼ in. thick, and had it bent into the shape shown in the diagram, thus giving a 30-deg. slope.

In taking a sample of slag the spoon is rested on the horizontal table above the incline, and then is rolled over so that the slag will flow gently down the slope. It must not be thrown down, but must roll of its own accord. Then, after it has come to rest, it is broken up and the thickness at a point perhaps one-quarter of the way down is measured. If there are lumps in the slag these must be avoided in taking the measurement. This thickness measurement has been found a valuable guide in controlling slag conditions on certain heats.

Trying to Eliminate Ingot Cracks

Another report from the Bureau of Mines was made by Charles F. Christopher, metallurgist, Pittsburgh, regarding efforts to eliminate cracks in ingots. He reported having seen these cracks on all grades of steel, and said that he had seen them when the molds had received tar wash, aluminum wash and other treatment. He has reached the conclusion that they cannot be blamed on the tar.

A question which he brought up had to do with the reports that the cracks are usually absent in steel below 0.15 per cent carbon, and usually absent in steel between 0.30 and 0.55 per cent carbon, but frequently present in steel with 0.15 to 0.30 per cent carbon. This is something which will have to be cleared up by further study—as to why this intermediate mild steel should act differently in this respect from steel both harder and softer.

Use of a special proprietary element intended to promote good quality in steel was reported upon by several speakers, none of whom had obtained from it what was desired. It was stated to have been explosive in its effect, making a big noise and throwing small globules and sparks of molten metal all over the place.

Dr. Herty, in studying its effect, made a small 25-lb. ingot from an acid furnace before the steel was tapped. He made another similar 25-lb. ingot after the first regular ingot was poured from the ladle in which this deoxidizer had been used. Analysis of the two ingots showed the following physical results:

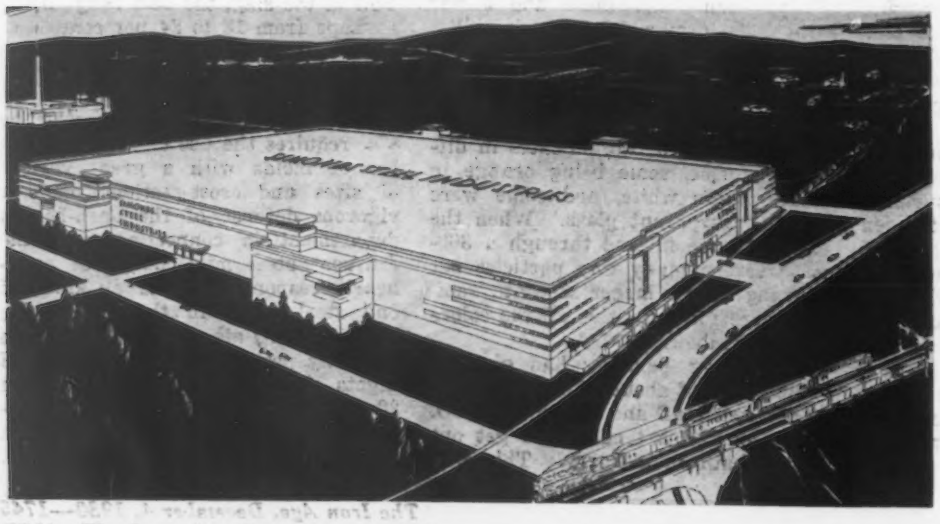
	Before Use	After Use
Elastic limit, lb.....	84,000	83,000
Ultimate strength, lb..	184,500	177,500
Elongation, per cent..	13.0	13.0
Reduction in area, per cent	25.1	26.5

Dr. Herty referred to the use of this material as having afforded an "expensive pyrotechnic display."

Weston Fellowship in Electrochemistry

A fellowship of $1,000 of the American Electrochemical Society is open to candidates who have completed an undergraduate course in some college, university, or technical institution and have received a degree from such institutions. The candidates must possess marked capacity in carrying out research in electrochemistry. The candidate must be under the age of 30 at the time of the award of the fellowship. The award will be made without distinction on account of sex, citizenship, race, or residence. It will be made for a term of one year, but the board of directors shall have the option in its discretion of continuing the award to the same fellow.

Applications for the fellowship for the academic year Oct. 1, 1931 to June 1, 1932, must be received by the secretary of the society before March 1, 1931. Application forms are obtainable from the secretary, Dr. Colin G. Fink, Columbia University, New York. The successful candidate may carry out the research in electrochemistry at any institution of learning approved of by the board of directors of the society.



Architect's drawing of industry's first new windowless factory building to be constructed for the Simonds Saw & Steel Co., Fitchburg, Mass., by the Austin Co., engineer and builder. The building has neither skylights nor windows, being scientifically illuminated and ventilated. The building is designed to provide scientifically ideal working conditions for employees.

Locomotive Shipments 7 Per Cent Above 1929

WASHINGTON, Nov. 28.—Shipments of railroad locomotives in October totaled 50 units, against 65 in September, according to reports received by the Department of Commerce. All the October deliveries were for domestic use, 48 steam and two electric locomotives.

Unfilled orders at the end of October were 132 units, against 174 at the end of September. Unfilled orders at the end of October were made up of 96 steam and 31 electric locomotives for domestic account and one steam and four electric locomotives for foreign delivery.

Shipments in the first 10 months of 1930 totaled 667 locomotives, against 688 in the corresponding period of last year. The decline was entirely in the export list—16 this year against 80 last year. For domestic account this year's shipments have totaled 651 (632 steam and 19 electric), against 608 last year (570 steam and 38 electric). No electric locomotives were exported in either year.

Standards for Sampling Coal and Coke

The American Standards Association has approved American standard methods of laboratory sampling and analysis of coal and coke submitted by the American Society for Testing Materials, which is the proprietary sponsor for the project under A.S.A. procedure.

These methods were originally prepared by joint committees of the American Society for Testing Materials, American Chemical Society and the American Foundrymen's Association. They were adopted by the A.S.T.M. in 1916 and 1918, and were revised in 1921, 1924, 1927, 1929 and 1930 by the committee on coal and coke of the society. The recent revisions of the methods consist of minor changes in some of the methods of test and do not radically alter any of the procedures.

Railroads Making Repairs on Deferred Accounting

WASHINGTON, Nov. 28.—While it has been definitely stated that the administration is not urging railroads to place orders for equipment as a means of relieving the industrial depression and unemployment situation, it is evident that the Government is giving practical encouragement to outlays by the carriers in their effort to alleviate conditions. This attitude on the part of the Government has been shown in two recent cases, where railroads made application for and were given permission by the Interstate Commerce Commission to make expenditures for immediate repairs with the understanding that the sums shall not be charged to operating expenses until the equipment is placed in service.

The Chicago & North Western has been granted such permission to expend $500,000 in the repair of cars and locomotives, while the Missouri-Kansas-Texas has been given permission to spend $200,000 in making heavy repairs to equipment not in service. The equipment is not needed at present, but the railroads asked to make the expenditures on the accounting terms indicated "to relieve so far as they can the present grave situation with respect to unemployment," as pointed out in the commission orders.

Wholesale Prices Moved Down in October

After virtual stability for three months, wholesale commodity prices resumed the downward movement begun in the summer of 1929, according to the United States Bureau of Labor Statistics. The October average of 82.6 may be compared with 84.2 in September and 84.0 in both August and July. All figures refer to 100 as the 1926 average. The present drop is widespread; every one of the ten major groups declined—an unusual circumstance.

Metals and metal products continued a decline which has been uninterrupted since April, 1929, reaching 90.4, in place of 91.8 in September. Non-ferrous metals showed the sharpest drop in this group—71.2 to 67.8—with iron and steel going from 89.5 to 88.6 and automobiles from 101.6 to 100.2. Agricultural implements at 94.9 and "other metal products" at 98.4 remained unchanged.

Raw materials showed a decline from 82.1 to 80; semi-manufactured articles, from 76.5 to 75.5; finished products, from 86.8 to 85.6, from September to October.

Diesel Engines for Ship Propulsion

A well illustrated paper-bound book of 80 pages, dealing with marine Diesel engines and entitled "The Modern Trend in Merchant Ships," has been put out by the Busch-Sulzer Brothers Diesel Engine Co., St. Louis. The text is an address by Edward B. Pollister, president of that company, before the tenth annual Middle Western Foreign Trade and Merchant Marine Conference, which took place at Indianapolis on Oct. 28. The illustrations are numerous and show all types of ships—passenger, merchant and others, including tankers—while the text gives figures of production of ships powered by Diesel motors, current prices of fuel oil at different ports in the world and information regarding the improvement in efficiency of Diesel propulsion, compared with steam.

Commerce Bureau Expedites Gathering of Facts

WASHINGTON, Nov. 29.—With world wide economic conditions constituting the outstanding factor in both foreign and domestic service, the Bureau of Foreign and Domestic Commerce, Department of Commerce, has expedited the gathering and distribution of facts and figures, increased its cable service abroad by more than 25 per cent and strengthened all its statistical and information services. This has been done for the purpose of aiding American business to cope successfully with the grave problems which have accompanied the present depression, it is pointed out by Director W. L. Cooper of the bureau in his annual report.

On behalf of domestic commerce, the bureau has rushed to completion many researches which it felt would be of practical value in the present emergency. The response of the business public to these measures is shown by a marked increase in the number of performed services, which reached a record total of 3,632,000 during the fiscal year ended June 30.

Revised Safety Code for Powdered Fuel

A revision of the American standard "Safety Code for the Installation of Pulverized-Fuel Systems" is announced by the American Standards Association. Rapid increase in the use of pulverized fuel in many industries, resulting in new developments in methods and design of equipment, is responsible for the revision. The original code was approved by the association in 1927.

The code covers construction and ventilation of buildings housing fuel-pulverizing equipment and specifications for dust-collection systems. Specifications are given covering methods of preventing explosions through static, through drying of coal and through its transportation in pipe lines. The code contains also suggestions for safe operating rules, to be printed on instruction cards for guidance of employees in charge of operation of such systems.

Contracts totaling $106,751.59 have been awarded by the Aeronautics Branch of the Department of Commerce for equipment and work on the airways. The contracts include radio marker beacons, airway course lights, an electric power plant, and clearing, grading, conditioning and fencing six intermediate landing fields.

The Bureau of Supplies and Accounts, Washington, recently opened bids for approximately 1325 tons of medium black steel plates for light cruiser No. 38, to be built at Mare Island, Cal.

Business as Others See It

Digest of Current Financial and Economic Opinion

WHAT long-continued mark will the present depression leave upon American business? asks New York *Times*. Hand-to-mouth buying and expansion of mass distribution came to us from that of 1920-1921. "At present not a little is heard of the probabilities of promoting mass consumption."

Consumption of materials and the using up and wearing out of merchandise have been going on steadily and more rapidly than production, in the opinion of Union Trust Co., Cleveland. "When [the resultant] shortage becomes sufficiently acute it will be reflected in immediately renewed buying."

This bank sees definite signs which indicate that the end of depression is approaching. Among the favorable indications noted are: Declining merchandise stocks, progress in price readjustments, increase in consumption "and completion of the deflation process. . . . It is our opinion that deflation in wholesale commodity prices is now approaching an end and that the process is continuing with respect to retail prices also."

Similar views are expressed elsewhere as to the nearing date for betterment to become readily recognizable. "Business shows more definite signs," says *Business Week*, "of having hit that hard-pan resistance level which in the past it has always encountered at about 20 per cent below normal. . . . Though basic industrial activity is still declining, general trade has begun to expand at somewhat more than the seasonal rate."

And Alexander Hamilton Institute lists nine developments as distinctly favorable, saying "Below the surface, forces making for recovery have gained in strength. The low level of prices, the need for replenishing goods, the large supply of credit available for financing expansion have created an increasingly favorable situation. . . . The failure of prosperity to appear suddenly does not warrant disparagement of moderate improvement."

A strong plea for "fair play for the railroads," in the direct interest of better business conditions in general, has come from several quarters. Thus, in *Financial Chronicle*, "Anything that puts the railroads in jeopardy is detrimental to business in general. . . . Anything calculated to revivify this great carrying system must serve immediately to restore and revive general business. . . . Helping the railroads to their feet is perhaps the quickest way of bringing about the trade revival for which the whole country is so earnestly longing."

Ingots the Great Index

Characterizing steel ingot production as "the great mirror of business as a whole," *Annalist* looks to January for signs of uplift. Attention is directed to the fact that only once since 1919 has the January steel rate fallen below December, and that once was ten years ago. And February has shown a higher rate than January eight times in the 10 years. Automobiles and railroads are cited as probable boosters for these expected gains.

Business continues in the declining phase of the cycle, says Harvard Economic Society. "But experience during past depressions indicates that the decline is nearing its end, and that recovery will begin in the first half of next year, and probably in the first quarter."

Forces Acting on Roll-Neck Bearings

(*Concluded from page* 1679)

be relatively inexpensive compared with the cost of the bearing, and the absence of failures thereby occasioned would help the reputation of the bearing manufacturer.

Analyses of 60 types of alloy steels rolled by the Timken Roller Bearing Co. have been made, in conjunction with the checking of instruments of various types used in measuring roll pressures.

Although there are severe space limitations on two-high mills, there are several cases of roller bearing installations which are operating satisfactorily. One unusual case was cited in which roller bearings were placed on the middle roll of a three-high mill, with the top and bottom rolls carried on plain sleeve bearings.

A big factor in connection with the flaws in rollers of bearings lies in the type of steel used in making the roller. Investigations have resulted in the present practice by the Timken plant of using carburized steel for large bearings, and in some cases for the small bearings also. This provides a gradation of hardness from the surface into the tough core.

This company reported that X-ray examination has not been used for the purpose of detecting flaws in rollers. There is a method of selection, however, which has been used with high success. Each bearing, as assembled, is inspected with regard to noise by the use of a radio device connected with a galvanometer. This has resulted in eliminating returns of bearings from automobile plants which formerly had sent a good many back, on the complaint that they were noisy.

This is abstract of a report of the Special Research Committee on Heavy-Duty Anti-Friction Bearings, read at Chicago on Sept. 25, before the iron and steel division of the American Society of Mechanical Engineers. Professor Trinks is chairman of the committee and Mr. Hitchcock is its research associate.

Shipments of stamped and enameled ware in 1929 made by 579 establishments were valued at $174,879,957, compared with $122,275,976 reported for 1927 by 365 establishments, according to the Bureau of the Census. The number of wage earners was 38,716 in 1929, or 35.4 per cent more than the 28,594 in 1927. Wages totaled $48,368,592 in 1929 against $35,154,846 in 1927.

THIS ISSUE IN BRIEF

December 11, 1930

'Ware of "Bargains"

Don't let a "bargain" price stampede you into buying a quantity of a certain item far beyond your needs. Unbalanced inventories cause losses.—Page 1749.

* * *

Undue Casting Shrinkage

This common cause of foundry loss is due to improperly proportioned patterns. Engineers should appreciate the importance of uniform sections.—Page 1752.

* * *

Decreasing Duralumin Corrosion

Quenching duralumin sheets in oil results in much less deformation than quenching in water, but cold water quenching increases resistance to corrosion. Alclad sheets may be oil-quenched without impairing corrosion resistance.—Page 1759.

* * *

Gray Iron Die Castings

Ford saves 1.46c. per push rod by use of rotary die casting machine. Dies are protected by acetylene soot, so that castings do not stick.—Page 1761.

* * *

Tests Casting Soundness

Inspector drops small castings on steel block, telling by the sound of impact whether they are cracked.—Page 1762.

Continuous Japanning

One continuous conveyor carries automobile parts through three dip tanks and three bake ovens set in single straight line.—Page 1764.

* * *

Fallacious Welding Costs

Labor, material and price alone should not be considered in determining price. Economic value of the product is a highly important factor. Lifetime cost rather than initial cost should fix the price.—Page 1767.

* * *

Thin-Walled Blast Furnaces

Because of air-cooling thin wall has long life. Coke consumption is reduced. Lines remain practically unchanged for long periods, contributing to ease of control.—Page 1770.

* * *

Low Prices and High Costs

Before you change your source of supply to take advantage of a lower price be sure that irregularity in deliveries and quality will not cause you loss in idle machinery.—Page 1750.

* * *

Inventory Speculating

Manufacturer who tries to make his major profits on inventory appreciation in reality becomes a material market speculator, and usually his main business suffers.—Page 1750.

* * *

Planned Schedules Increase Profits

Waste is caused by lack of effective coordination. Schedule your production three months ahead, so that production and purchasing departments can plan economically.—Page 1751.

* * *

Galvanizing

Even small amounts of iron in zinc can be detected with the microscope. Iron is easily identified as the compound Fe Zn, a hard, white crystalline constituent.—Page 1772.

Steel Instrument Panels

Slate and marble panels are subject to breakage during shipment. They chip easily and produce abrasive dust when worked. Dust is detrimental to delicate instruments. Steel panels are more attractive, more durable, cost less.—Page 1768.

* * *

Specifier and Buyer Must Cooperate

A large sum is lost to industry each year through lack of cooperation between those who specify and those who procure. Buyer must work closely with department using the material.—Page 1751.

* * *

Synthetic Sand Is Best

It has qualities which make it superior to natural molding sand. Fineness of grain can be kept constant, and bond and moisture content can be kept right easily.—Page 1754.

* * *

Gas Hole-less Brass Castings

Bronze or red brass castings (under 10 per cent zinc) can be made cheaper and better by fixed carbon fuel process. No gas holes, no fumes.—Page 1757.

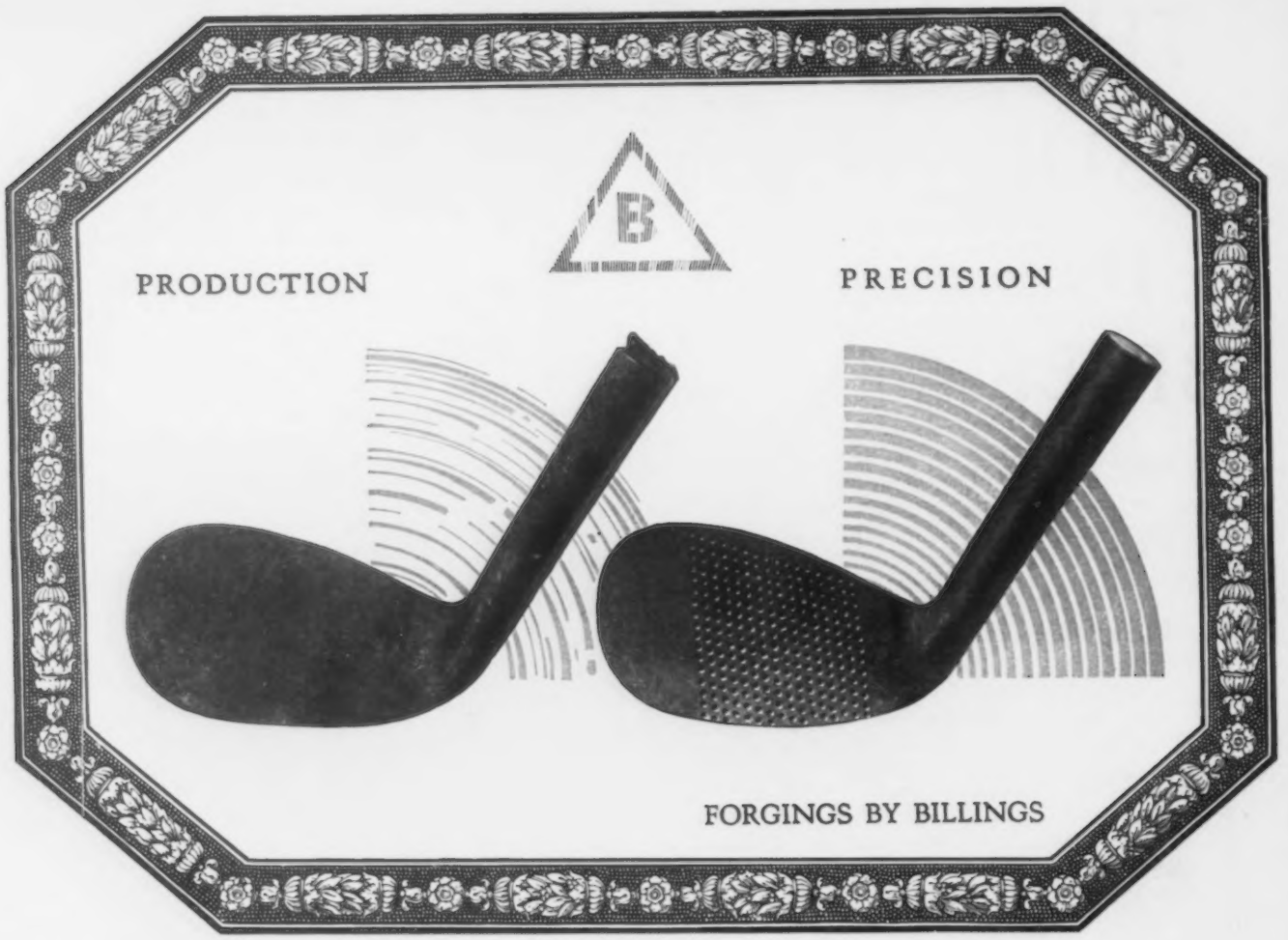
NEXT WEEK

HERE'S some of the offerings of the coming issue.

X-ray testing of welds; a process that has proved itself in establishing the dependability of heavy pressure vessels of welded construction.

Continuous suspended molding machines, continuous sand handling and continuous finishing of radiators of the American Radiator St. Paul plant.

Precision forging that gives results commensurate with the closeness to dimensions characteristic of die castings.



SEND FOR these Sample Forgings

COMPARE—for Amount of Finishing Required

TWO Niblick forgings; both ours. At left: a good-grade commercial forging, worth approximately nine cents. At right: a BILLINGS precision forging, to be ground at a saving of four cents over the rougher "production" job. With the face scoring forged in, saving a later operation. Smooth surface, close tolerance; accurate setting of loft and angle of hosel. Costing slightly more to forge, but costing so much less to *finish* that the precision job is far better economy. Which applies to *all* Billings precision forgings—"semi-machined" finish. Send for the golf head samples and make your comparisons!

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